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Articulator Development and Importance of Condyle Paths—*Gillis*
Progressive and Rational Dentistry—*Goslee*
Ethylene in Oral Surgery—*Caine*
Clasmatocytes in Pyorrhea—*Beckwith and Morrison*
Broadening Service of Periodontist—*Leonard*
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President-Elect of the American Dental Association

THE JOURNAL
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Original Communications

ARTICULATOR DEVELOPMENT AND THE IMPORTANCE OF OBSERVING THE CONDYLE PATHS IN FULL DENTURE PROSTHESIS

By ROBERT R. GILLIS, D.D.S., F.A.C.D., Hammond, Indiana

(Read before the Chicago Dental Society, January 21-23, 1925)

ARTICULATOR development and the importance of observing the condyle paths in full denture prosthesis has engaged the serious study of denture prosthetists for several decades; in fact, ever since Walker raised a question as to the correctness of Bonwill's articulator.

The movements of the mandible may be resolved into a few components, relative to the immobile maxilla: (1) opening; (2) protrusive; (3) lateral, right and left, and (4) intrusive.

The first movement, that of simple opening (and closing), was the only one recognized by the earlier prosthetists, as exemplified in their articulators.

The plaster articulator (Fig. 1) extended into approximating posterior blocks provided the only articulator used by dentists until about 1805, when Gariot[1] invented what was probably the first mechanical articulator (Fig. 2), which we know today as the plain hinge articulator, affording only the simple hinge movement. This device supplied the needs of the early dentists until Evans,[1] in 1840, patented an articulator (Fig. 3), which provided somewhat for a protrusive and a lateral movement of the mandible by means of horizontal condyle slots.

A few years later, Bonwill,[2] in 1858,

1. Wilson, G. H.: A Manual of Dental Prosthetics, Ed. 1, Philadelphia, Lea & Febiger, 1911; p. 166.

2. Richardson, Joseph: A Practical Treatise on Mechanical Dentistry, Ed. 1, Philadelphia, Lindsay & Blakiston, 1860; p. 166. Litch's American System, 2: 488.

devised his well known articulator (Fig. 4) and gave to the professon the fruits of his extended research work. Bonwill's enthusiasm and scientific presentation were a step far in advance of anything preceding his time, and he may

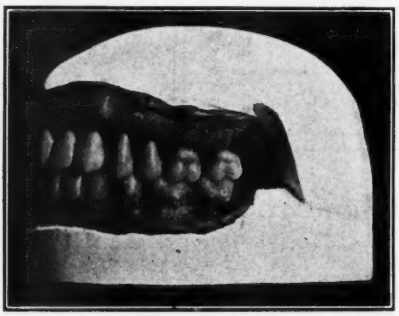

Fig. 1.—Plaster articulator.

justly be called the father of scientific denture prosthesis. Until the profession began to study his teachings, almost nothing had been accomplished that would afford a patient anything more than a mere up-and-down chopping motion in the function of mastication.

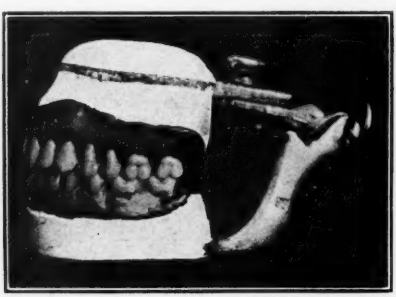

Fig. 2.—Gariot (plain line) articulator (1805).

Bonwill's articulator also provided a protrusive and a lateral articulator movement, the lateral movement of the condyle on the working side still being without inward inclination.

So, from 1858, we have three of the component mandibular movements—opening, protrusive and lateral—incor-

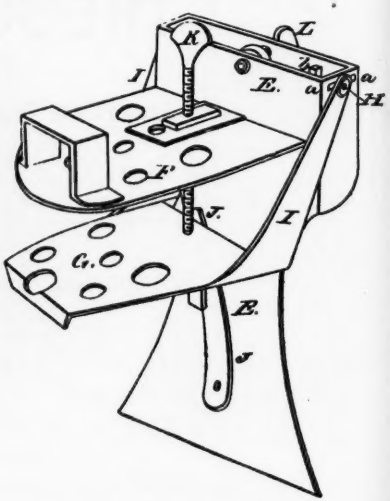

Fig. 3.—Evans articulator (1840).

porated in the articulator movements, in the order of their introduction.

While Bonwill made no claim to be-

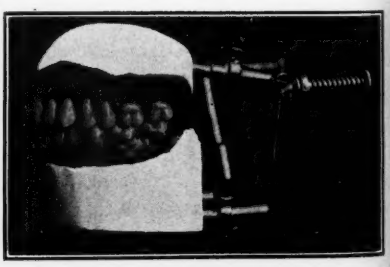

Fig. 4.—Bonwill articulator (1858).

ing a highly educated man in a scientific way, he had a superior mechanical ability and was possessed of unusual powers of observation and deduction.

His predecessors had afforded nothing beyond simple occlusion of pros-

thetic dentures. He saw and appreciated the intricate and beautiful design of the human masticatory apparatus, and he in establishing the value of articulation; although, in the light of more recent findings, we know that his enthusiasm

Fig. 5.—Hayes articulator (1889).

strove to accomplish the same functioning in his service to his patients.

With the advent of his teachings, we may consider that "articulation of dentures" became a possibility and an essential feature of successful dentures. We honor and respect him as the pioneer

caused him to overestimate the value of his instrument.

For forty years, Bonwill's articulator was the peer of dental articulators, although other operators found themselves unable to attain such perfect results as he claimed for it. This inability to deliver satisfaction led several men to seek improvements.

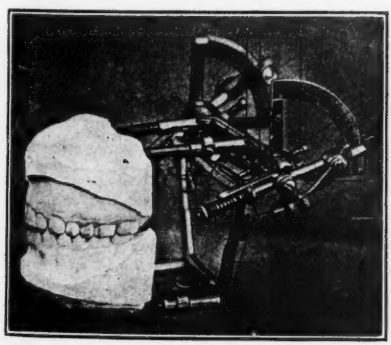

Fig. 6.—Walker articulator (1895).

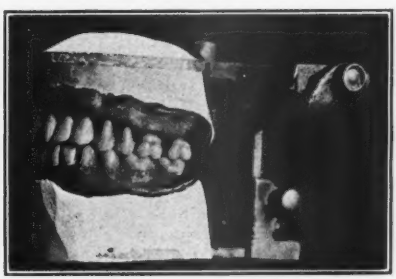

Fig. 7.—Buffalo Dental articulator (1897).

Hayes (Fig. 5),[3] in 1889, brought forth the first device that provided a forward and downward inclination for the condyle guidance in his articulator.

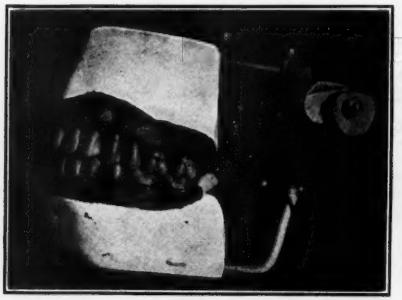

Fig. 8.—Grittman articulator (1899).

Walker (Fig. 6)[4] had raised serious objections to certain features of the Bonwill articulator years before, but not until 1895 did he complete a device that

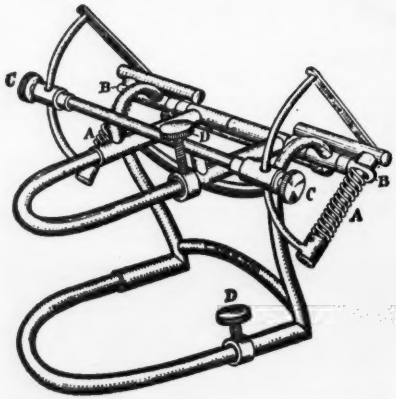

Fig. 9.—Christensen articulator (1901).

afforded a variable forward and downward condyle path.[5]

Luce[6] of Boston and Schwarze[7] of Leipsic, each demonstrated the true condyle path at about the same period as Walker, but their findings were not published in American dental literature. So to Walker goes the credit of having established the fact that the condyle paths are not alike in different people and often differ between right and left in the same person.

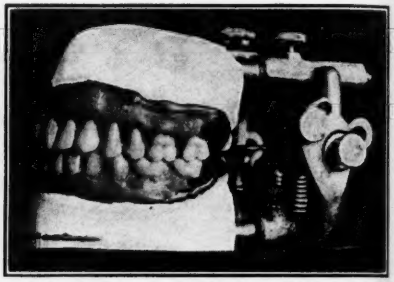

Fig. 10.—Kerr articulator (1902).

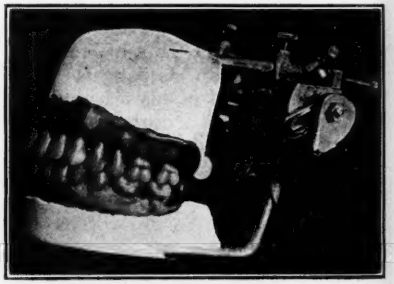

Fig. 11.—Snow (New Century) (1907).

Articulators of the second period (1897-1910) are: Buffalo Dental (Fig. 7),

3. Prothero, J. H.: Prosthetic Dentistry, Chicago, Medicodental Publishing Co., 1916; p. 1115.

4. Walker, W. E.: Prosthetic Dentistry: The Glenoid Fossa; The Movement of the Mandible; The Cusps of the Teeth, Dent. Cosmos, 38: 34 (Jan.) 1896; The Facial Line and Angles in Prosthetic Dentistry, Dent. Cosmos, 39: 789 (Oct.) 1897.

5. Walker, W. E.: Dent. Cosmos, 39: 789 (Oct.) 1897. Turner, C. R.: American Textbook of Prosthetic Dentistry, Ed. 4, Philadelphia, Lea & Febiger, 1914; p. 414.

6. Luce: Boston. M. & S. J., July 4, 1889.

7. Schwarze: Tr. 9th Internat. Med. Cong.

1897; Grittman (Fig. 8), 1899; Christensen (Fig. 9), 1901; Kerr (Fig. 10, 1902; Snow (New Century) (Fig. 11), 1907; Gysi Adaptable (Fig. 12), 1910.

From 1895 until the present time, all investigators have accepted a downward and forward inclination of the condyle path. Some have failed to recognize its full importance or to incorporate it correctly in such articulators as they may have devised; but all are agreed as to its existence.

Grittman,[8] in 1899; Christensen,[9] in 1901; Kerr, in 1902; Snow,[10] in 1907;

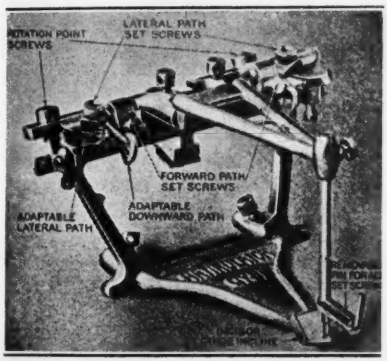

Fig. 12.—Gysi Adaptable articulator (1910).

and Gysi Adaptable,[11] in 1910, followed in rapid succession with improved articulators, each embodying their respective theories of mandibular movement reproduction.

In 1899, Snow introduced his face-bow. This simple but effective device is one of the most valuable accessories (we consider it an indispensable adjunct) ever given to denture construction. It establishes the position of the maxillary cast in the articulator in the same relation to the condyle line that the maxillary ridge occupies, relatively, in the mouth.

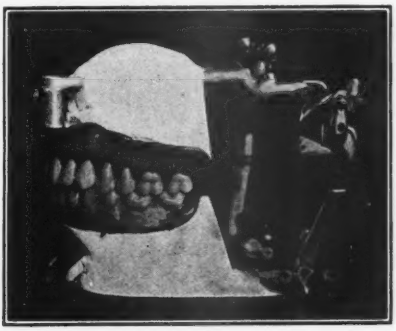

Fig. 13.—Gysi Simplex articulator (1912).

Figure 14 shows the face-bow on the patient, and Figure 15 illustrates its application on the articulator.

It has long since been demonstrated

Fig. 14.—Face bow on patient.

that the equilateral triangle of Bonwill (Fig. 16) is only a theory, and it is used today only for graphic demonstrations. In practice, we find few mandibles with

8. Essig: Prosthetic Dentistry, Ed. 2, p. 426.

9. Christensen, Carl: Problem of the Bite, Dent. Cosmos, 47: 1184 (Oct.) 1905.

10. Essig: Footnote 8, p. 427.

11. Gysi, Alfred: Dent. Cosmos, 52: 1148, 268, 283 (Jan.-April) 1910.

natural teeth that fit the Bonwill equilateral triangle.

Hence, if we would meet the needs of each individual case, we must register the positional relation of the case and transfer such relation to the articulator.

Figures 17, 18, 19 and 20 show variations met with in everyday practice and prove the impracticability of constructing all denture cases to the same average mounting.

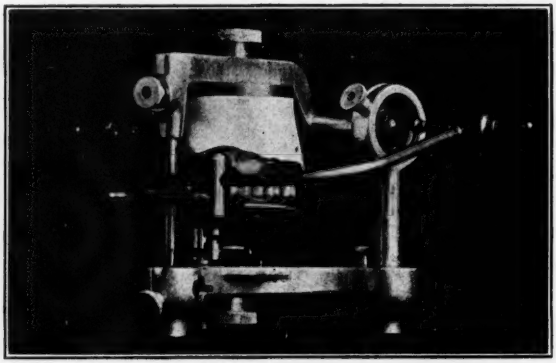

Fig. 15.—Face bow on articulator.

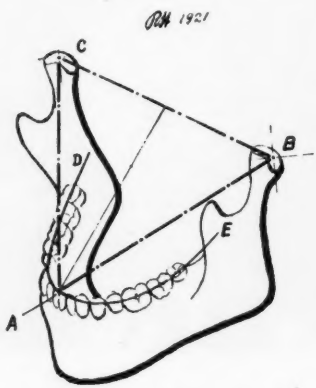

Fig. 16.—Bonwill triangle.

These cases present variations in the altitude of the Bonwill triangle projected into the occlusal plane, measuring from the median incisal posteriorly to a point where the occlusal and sagittal planes intersect directly below the condyle line.

Figure 17 shows a case presenting short altitude, 60 mm.; Figure 18, a case presenting the same condition as Figure 15*a*, maxillary cast removed;

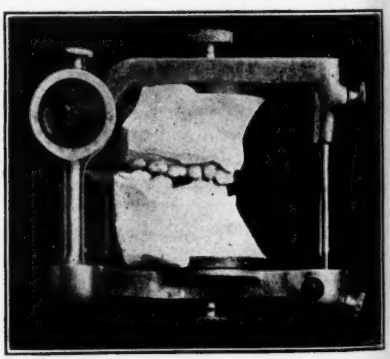

Fig. 17.—Case presenting short altitude; 60 mm.

Figure 19, a case presenting an altitude of only 55 mm.; Figure 20, a case presenting a long altitude, 93 mm. The

same dimension of the Bonwill ideal triangle would be 83 mm.

Figure 21 shows arcs of circles described on radii of the altitudes of the mandibular triangles shown in the preceding illustrations.

You can readily understand from Figures 22 and 23 why there would be cusp interference in a case that has been built to one of these arcs, on any articulator, when there was an attempt to function on another arc, in the patient's mouth.

Figure 22 shows the variance in arcs of tooth movement when the case presents a longer altitude than does the articulator.

Figure 23 shows the variance in arcs of tooth movement when the case presents a shorter altitude than does the articulator.

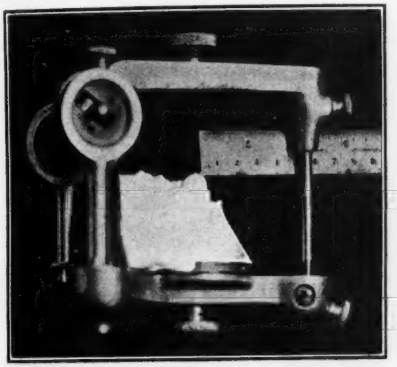

Fig. 18.—Case presenting short altitude; maxillary cast removed.

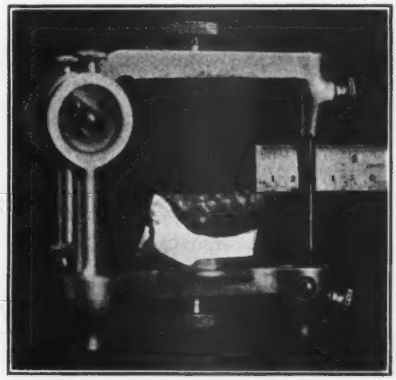

Fig. 20.—Case presenting long altitude; 93 mm.

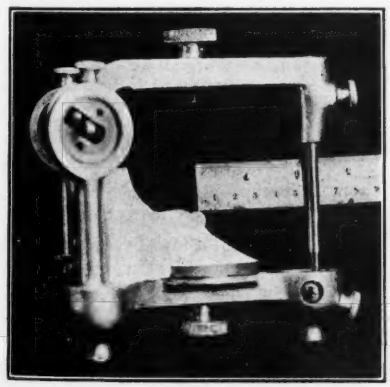

Fig. 19.—Case presenting altitude of only 55 mm.

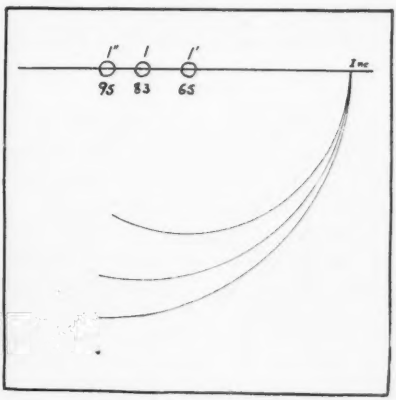

Fig. 21.—Arcs described from 95, 83 and 65 mm. arcs, as shown in Figures 17-20.

In both figures, the heavier arc indicates the hypothetical articulator movement, and the lighter arc, that of the individual case. Arbitrary rotation centers have been chosen; but the same variation holds true from any other rotation center.

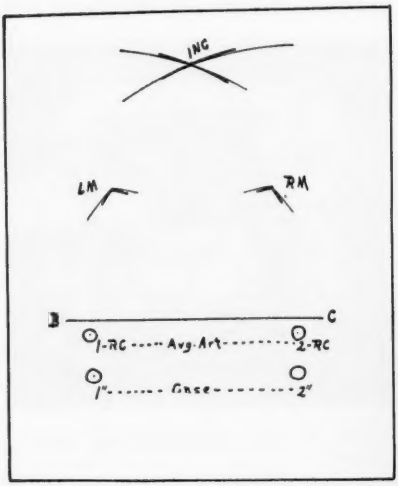

Fig. 22.—Variance in arcs of tooth movement when case presents longer altitude than articulator.

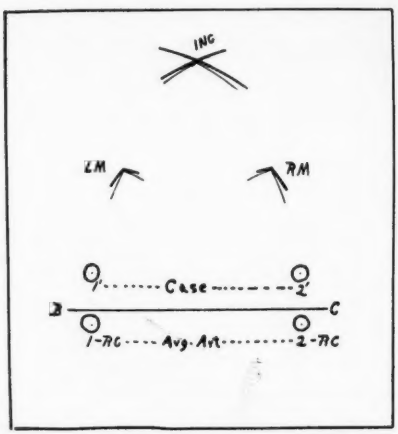

Fig. 23.—Variance in arcs of tooth movement when case presents shorter altitude than articulator. In Figures 22 and 23, the heavier arc indicates the articulator movement and the lighter arc that of the individual case. Arbitrary rotation centers have been chosen; the same variation holds true from any other rotation center.

The face-bow measurement is a required feature of all the more precise modern denture technics. Technics requiring only an "average" or "guessed-at" mounting of casts will fail to provide articulation.

Figure 24 (right side), Figure 25 (left side), and Figure 26 (front)

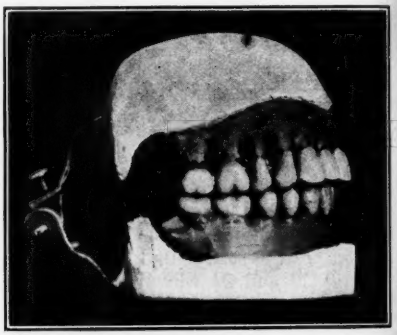

Fig. 24 (Right).—This Figure and Figures 25 and 26 show the error of accommodation in the mouth of the patient in central relation of the mandible, due to error in bite and miscalculating in mounting the casts in the articulator.

show error of accommodation in the mouth of the patient, in the central relation of the mandible to the maxilla, due to error in bite and miscalculating in mounting the casts in the articulator. A central occlusion of the masticatory surfaces was established by this dentist, but it did not coincide with the true central relation between mandible and maxilla. This shows the failure to associate "central occlusion" of the masticatory surfaces with "central relation" of the mandible to the maxilla.

In 1908, Bennett of England intro-

duced a new consideration in mandibular movements when he called attention to the bodily lateral movement. This, a

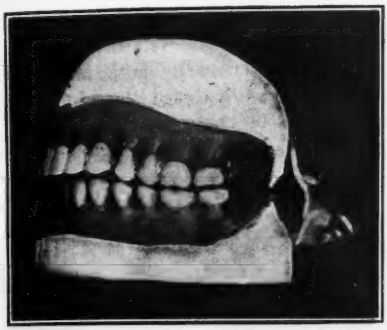

Fig. 25.—Error on left side.

slight sidewise thrust, readily demonstrable, is incorporated in the more recent articulators.

Through all the second period of articulator development (1895-1910), every operator sought to reproduce the individual movements of the patient's mandible.

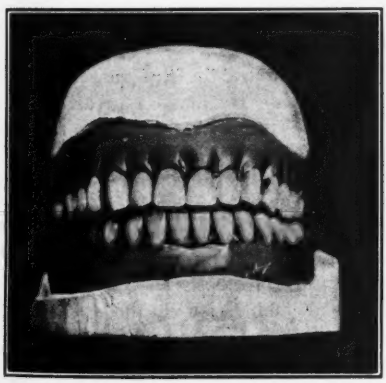

Fig. 26.—Front view of case illustrated in Figures 24 and 25.

Each and every one of these investigators recognized the necessity of considering the variability of the condyle paths in different persons and also the difference usually found between right and left in the same person. The measurement and reproduction of the condylar movement came to be considered indispensable to correct articulation of prosthetic dentures.

A statement of Gysi[11] is typical: "The longer we study the movements of the mandible, the more shall we be astonished at their infinite variety" and "The problem of articulation will not be solved until the (mandibular) movements can

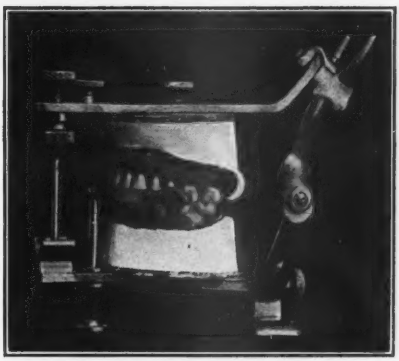

Fig. 27.—Hall articulator (1915).

be exactly imitated,—not only for the average normal case but for each individual one."

Now comes a period wherein the scene changes. The American sponsors of Gysi's splendid Adaptable articulator failed to find a ready reception for such an instrument in the dental profession. The Gysi Adaptable was found to be beyond the technical ability and finances of all but a few dentists. So another instrument was devised, with Gysi's name attached,[12] which could meet competition on price and did not call for any great effort in the application of

12. Clapp, G. W.: Dent. Digest, 19: 669 (Dec.) 1913.

its technic (Gysi's Simplex [1912] [Fig.13]).

Thus we are faced with a reversion—a backward step—to the "average type" articulator.

While the Simplex probably afforded some improvements over the articulators of 1805, 1840 and 1858, it was a decided retrogression from the position that had been gained in the introduction of the Walker, Kerr, Snow and Gysi Adaptable.

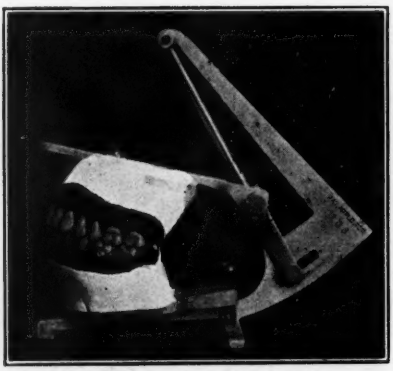

Fig. 28.—Monson articulator (1918).

The claims made for the Gysi Simplex that it is "simple and scientific" are true only if the patient is a near-fit to the articulator. Such a vast majority of patients do not present on both sides a 33 degree condyle path that we fail to appreciate its scientific application, and this same variation in condyle paths only adds complications to the case rather than simplifications.

In the words of Prothero:[13] "I do not wish to cast any aspersion on the ability of the designer. His previous efforts in this field bear the imprint of a master hand; but in the light of our accumulated knowledge and with our present day appliances, the Simplex articulator is a travesty in the anatomic field."

Today, that final sentence may be applied with equal force and truth to all average articulators.

About 1915, Hall[14] startled the profession with statements quite the reverse of commonly accepted teaching and practice. He contended that articulation of the teeth in mastication guides the mandibular movements and that the condyle paths may be quite disregarded since the excursions of the condyles are

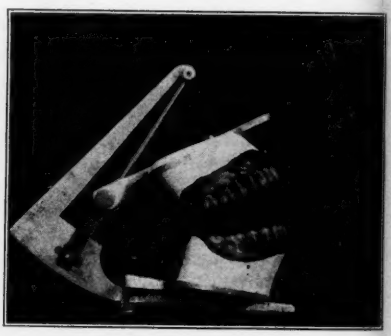

Fig. 29.—Monson articulator.

so very limited in the movements of mastication. He devised an articulator (Fig. 27) in which an average condyle inclination of 45 degrees was accepted. To Hall and to his confrére, House, we must give credit for having been largely instrumental in creating new enthusiasm and bringing about a renaissance in denture prosthesis.

Their impression methods, together with those of Greene and Supplee, were far in advance of what had been taught or practiced previously. As these advanced technics became more commonly used, many dentists took a renewed interest in denture work. However, too

13. Prothero, J. H.: J. Allied Soc., Sept., 1913.

14. Wilson, G. H.: Footnote 1 (Ed. 3), p. 260.

many dentists pinned their faith to the perfected impression methods as the panacea for all their denture troubles. Dentures were made so well adapted to the alveolar ridges and tissues that they could be dislodged only by considerable effort by either patient or dentist, for some time after placement.

Then something happened—too frequently and too soon. The dentures became loose.

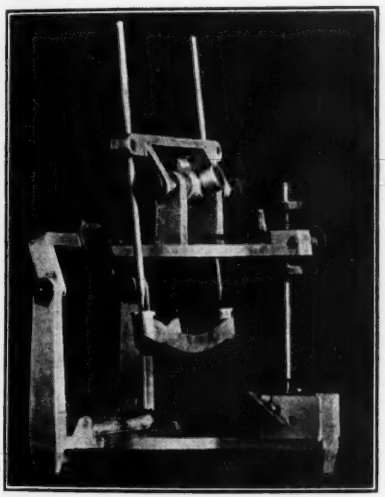

Fig. 30.—Needles articulator (1921).

The new born denture prosthetist had yet to learn that an improved impression technic plus an articulator was only the initial requirement for his success. He had used neither with full intelligence. He had failed in his tooth arrangement to establish perfect articulation in the mouth, no matter how perfectly the dentures may have articulated in the articulator. Failure and disappointment were sure to follow in direct proportion as he had failed to establish or provide perfect articulation in the mouth.

The failure of dentures to function is accounted for variously by various men. The examination of the product of many prosthetists and a careful study of our own failures leads us to believe that malarticulation is the greatest of all causes for failure. Accidents of vulcanization and finishing; faulty impression; expansion, warping, or contraction of the casts; unfavorable ridge conditions, and a dozen other alibis for failure dwindle into insignificance when the failures due to malarticulation are considered.

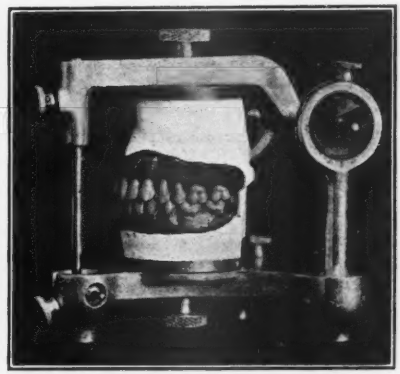

Fig. 31.—Hanau articulator (1921).

No system of impression making, no single phase of chair or laboratory technic, can possibly lead to satisfactory results, unless perfect articulation is established in the mouth. Neither can balanced central occlusion be maintained long when perfect articulation is wanting.

In our limited experience, we have never seen a patient presenting soft flabby ridges unless he also presented a history of having worn badly articulated dentures.

The alveolar ridges and their mucoperiosteal investing tissues were never intended to carry the load of mastica-

tion. When malarticulated dentures distribute an uneven load upon these supporting tissues, the result is exactly parallel with the result observed in traumatic articulation of natural dentures. Malarticulation in both natural and prosthetic dentures produces atrophic irritation of the alveolar process, resulting in pyorrhea and soft flabby ridges, respectively. It would be interesting indeed to see a case of soft flabby ridges not so associated.

In 1918, Monson[15] produced his maxillomandibular instrument (Figs. 28 and 29), which is based upon the spherical theory of tooth arrangement and mandibular movements.

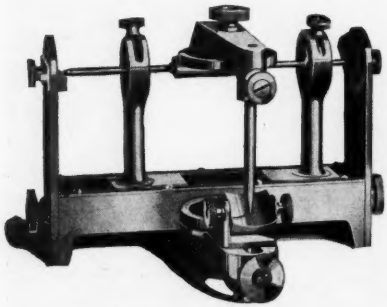

Fig. 32.—Kinoscope (Hanau).

In 1921, Needles produced an articulator (Fig. 30) based upon the researches of Gysi, and also incorporating features of the spherical theory; but he later (1922) added individually adjustable condyle paths.

In 1921, Hanau devised an articulator that finds close ancestry in principle in the Walker, Kerr, Christensen, Snow and Gysi Adaptable; but its movements are controlled by a more accurate and accessible mechanism and its adjustments and operation are much simplified (Fig. 31). He also devised an instrument (the kinoscope) (Fig. 32) that lends itself to making exact measurements of mandibular movements, such as would be required by periodontists and orthodontists particularly.

To Hanau, we are indebted for his recognition of the "intrusive and extrusive" movement of the mandible.[16] This movement occurs during the application of stress or load of mastication and is attributable to the resiliency and like effect (*a*) of the mucoperiosteal tissues that support the denture bases, and (*b*) of the tissues of the temporomandibular joint.

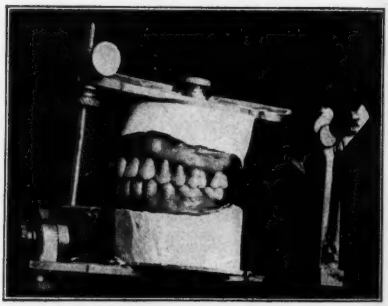

Fig. 33.—Wadsworth articulator.

While the Christensen and Snow technics of taking the bite afford approximately the same result, neither of these earlier investigators recognized the full importance of the part played by resiliency.

The Hanau articulator is designed to incorporate the basic mandibular movements (opening, protrusion, lateral) and with his technic compensates for the intrusive.

15. Monson, G. S.: disc. Hall, R. E.: Tissue Atrophy Resulting from Compression of Tissues for the Retention of Dentures, J.N.D.A., 8: 922 (Nov.) 1921.

16. Hanau, R. L.: Paper read before N. S. D. P., July, 1922.

Our study of the professional literature leads us to believe that Hanau is the first investigator to teach us that articulator movements should be the equivalent of mandibular movements rather than a reproduction of them.[17]

Frahm designed an adjustable articulator along the lines of the Gysi Adaptable. Wadsworth (Fig. 33), and several others during the past and recent years have devised instruments for which certain advantages are claimed.

Thus, we find ourselves confronted with a great array of different dental articulators, all of which may be divided

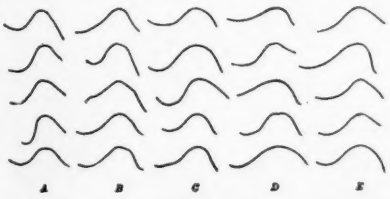

Fig. 34.—Tomes and Dollamore chart showing variation in left condyle paths of twenty-five patients.

into two classes: (1) the adaptable or adjustable type, capable of being fitted to the peculiar anatomy of each patient, and (2) the average or fixed type on which every case is built regardless of certain conditions in the patient that can be proved to exist (in fact, their existence is denied by none) and can be determined readily.

Which type, adjustable or average, shall we chose for our denture construction?

The construction of really successful dentures is a scientific operation. "The law of averages" is no safe guide for scientific workers.

As Frahm says[18] "All such articulators are built to the "law of averages" and all work done with them is average instead of individual. The tailor or oculist working on the law of averages would not succeed; why expect denture success on a like basis?"

Gysi has stated his belief[19] that 50 per cent of dentures can be built successfully on an articulator having fixed average condyle paths alike on both sides and that the other 50 per cent of cases call for special individual measurements and greater care in construction.

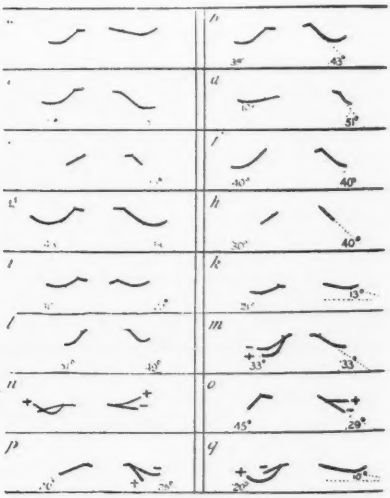

Fig. 35.—Gysi's chart showing difference between right and left condyle paths in sixteen cases.

Every authority who has studied the variability of condyle paths expresses more or less surprise at the great range of variability found. Tomes and Dolla-

17. Hanau, R. L.: Paper read before the Ohio State Dent. Ass'n, Dec., 1923; Dental Engineering, J.A.D.A., 9: 595 (July) 1922.

18. Frahm, F. W.: Dent. Cosmos, 56: 533, 1914.

19. Gysi, Alfred: Dent. Digest, 26: 673, 1920.

more[20] show a series of twenty-five cases (Fig. 34).

Gysi[21] gives results of his measurements showing a range of from 5 to 54 degrees, with a difference between right and left in the same patient varying from 0 to 41 degrees. He finds that the average is about 33 degrees.

Gysi's chart (Fig. 35) shows the difference between the right and left condyle paths in sixteen cases.

Table 1 (Gysi's) shows the variation found in thirty-five cases; inclinations from 5 to 54 degrees, with differences from 0 to 41 degrees.

Gysi's tracings on a protractor (Fig. 36) show how he arrived at his average of 33 degrees.

Table 2 shows the differences between the right and left of from 0 to 40 degrees, with a gross variance of 58 degrees, illustrating cases in my own practice.

Prothero reports finding condyle paths as steep as 70 degrees. He calls attention to the difference often found between right and left.

TABLE 1.—EXAMPLES OF ANGLES OF THE CONDYLE PATH*

Right	Left	Difference	Right	Left	Difference
54	54	0	33	38	5
40	40	0	43	38	5
33	33	0	35	30	5
51	50	1	30	25	5
26	27	1	26	20	6
39	37	2	28	20	8
28	30	2	21	13	8
23	21	2	40	32	8
35	37	2	10	19	9
40	42	2	34	25	9
32	35	3	22	31	9
31	34	3	30	40	10
33	36	3	28	39	11
37	40	3	40	25	15
5	9	4	29	45	16
36	40	4	46	29	17
10	14	4	23	45	22
			51	10	41

*The same cases are individually arranged.

TABLE 2.—DIFFERENCES BETWEEN RIGHT AND LEFT (MEASUREMENTS AUTHOR'S CASES)

Right	Left	Difference	Right	Left	Difference
20	20	0	48	34	15
38	35	3	20	6	14
−12	− 8	4	15	− 2	17
18	23	5	28	48	20
33	27	6	33	10	23
15	7	8	23	46	23
48	40	8	48	23	25
30	20	10	45	15	30
30	20	10	42	15	27
20	30	10	10	−20	30
40	28	12	−12	20	32
28	40	12	0	−35	35
43	30	13	+18	−18	36
			−12	28	40

20. Tomes and Dollamore: Odontol. Soc. Great Britain, April, 1901.

21. Wilson, G. H.: Footnote 1, p. 154.

Amoedo[22] reports finding differences of 35 degrees between right and left.

Weiss of Havana, from a study of thousands of skulls, concludes that the range is from 5 degrees to 45 degrees or more in different people and that the variation between right and left must be taken into consideration in denture construction.

Williams[23] presents illustrations (Fig. 37) of the variations as shown in the shapes of the glenoid fossae and condyle heads.

In my own practice, I consider it the unusual thing to find the two condyle paths alike in any patient (Table 2).

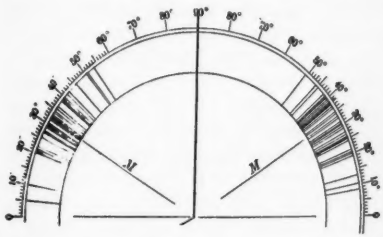

Fig. 36.—Gysi's tracings on protractor showing how he arrives at his average of 33 degrees.

Years ago, Dr. Flagg[24] said, apropos of dentures, "the patient could eat with a chip of wood if he would only stick at it long enough."

Turner [25] later wrote: "Purely physical forces (suction and atmospheric pressure) seldom maintain the denture so securely that natural-denture-methods of mastication succeed with artificial dentures. Unfavorable physical conditions add troubles that must be balanced by greater demands upon the patient's ability."

Williams[23] writes: "Nature's power of adjustment and the perseverance of the patient count for more than a little in the measurable degree of success which many artificial dentures exhibit."

Possibly, some may think these quotations were true for the bygone days,

Fig. 37.—William's cross-section of compound between condyle head and fossa, showing variations in contours of both fossae and condyle heads.

but do not apply today. Yet Giffen[26] says that the average denture construction is a disgrace to the dental profession; and, more recently, House[27] writes: "Only the ignorance of the patients and the kindness and forbearance of Mother Nature have made it possible for us, as

22. Amoedo, O.: Ash's Month., Aug., 1915; abstr. Internat. J. Ortho., 1: 537 (Oct.) 1915.

23. Williams, J. L.: A Study of the Temporomandibular Joint with Special Reference to the Form and Action of the Masticating Surfaces of the Teeth, J.A.D.A., 8: 275 (April) 1921.

24. Flagg: Quoted by Turner: Dent. Cosmos, 56: 927 (Aug.) 1914.

25. Turner, C. R.: Footnote 24.

26. Giffen, W. A.: Service and Compensation in Denture Prosthesis, J.A.D.A., 8: 208 (March) 1921.

27. House, M. M.: Correction of Malocclusion in Artificial Dentures, J.A.D.A., 7: 339 (April) 1920.

a profession, to satisfy our patients measurably, despite the employment of methods so glaringly indifferent and inaccurate."

The more modern the quotation, the stronger the terms used to describe denture inefficiency. Probably Flagg was right in saying that the patient could eat with a chip of wood after enough practice. There is undoubtedly room for improvement and increased efficiency in full denture prosthesis.

From the earliest of our literature on this subject up to and including the more recent contributions, we find authors decrying the discomfort and inefficiency of the average denture. That many patients who have lost their natural teeth wear their prosthetic dentures in their pockets or cupboard drawers is common knowledge.

The earlier denture makers struggled with handicaps of poor impression methods, unanatomic teeth, and articulators that failed to approximate mandibular movements.

Today our impression methods afford precision in the adaptation of denture base to alveolar tissues; the teeth supplied by several manufacturers are vastly improved, and articulators can be had that afford mechanical movements the equivalent of the mandibular movements of the patient. Nothing but ignorance, carelessness or lack of application on the part of the operator can now deny comfortable and efficient prosthetic dentures to the edentulous patient.

Gysi has stated that 50 per cent of our patients require something more than the service obtainable from the average type articulator. How may we know when a patient fits any of the "average" type articulators? How may we know his individual requirements? Only by making measurements of the individual and employing an articulator that can register like relations.

Quoting Gysi again: "Because it is impossible for a dentist to recognize which cases present abnormal movements unless he records and observes the mandibular movements in all cases—or until he fails with the procedure indicated for average cases; and because the recording of mandibular movements and their reproduction in an adaptable articulator are not difficult, I believe that any dentist who wishes to render a really professional quality of denture service will find the use of an adaptable articulator more satisfactory and more economical than the use of any non-adjustable articulator."

Many researchers named earlier in this paper have given evidence of the variability of the condyle paths; recent studies amply corroborate their findings. In addition, there has been given us by Hanau, within the last two years, substantial evidence of such a thing or condition as a reversed condyle path, wherein the condyle head apparently moves upward and forward rather than downward and forward (cases showing minus sign in Table 2).

It is not claimed that this reversed condyle path exists, *ipso facto,* in the human temporomandibular joint—but that movement, which is the result of an action in a traumatized temporomandibular joint plus the effect of the resiliency in the tissues supporting the dentures, makes necessary a reversed condyle path in the articulator in order to provide a movement in the articulator that will be the equivalent to the movement that occurs in the mouth.

This idea of "equivalent movements" is one that has not been brought to the attention of our profession emphatically, and we urge a careful consideration of it as a factor leading to greater success in denture prosthesis.

Most of us recognize those things which we can see; unseen things may be deducted from things seen. We cannot see the temporomandibular joint in action, but we can study the movements

of the teeth in the mouth directly and, when the teeth are correctly mounted in an adjustable articulator, indirectly.

The length of the overbite and the nature of the compensating curves can be seen and measured. Since the mandible is a solid body we may deduct the movement of the condyle head when we know the movement of any three points of the mandible; as incisive and molars, right and left.

Bonwill made such deductions, although most dentists consider that he had a total disregard of the downward and forward condyle path.

The controversy today really resolves itself into a question as to whether the condyles or the cusps of the articulating teeth are the guiding factor for the mandibular movements in mastication.

In a patient having natural teeth, if any tooth is moved from its natural position in the arch, the tooth so moved becomes traumatized, the condition growing progressively worse. The traumatizing of one tooth in either arch is liable to lead to the traumatizing of others, and to their eventual loss, if correction is not obtained.

It is my belief that if the cusp inclines of articulating teeth were the guiding factor, no such things as the traumatizing of a single tooth or several teeth could possibly occur, because the movement of that mandible would first be altered to accommodate the new guiding factor. We all know that such new guiding factor is always the first to suffer.

That the tooth cusps are the guiding factor in mandibular movements has been called "the floating condyle theory." The head of the condyle attached in its anatomic environment has a rather limited freedom of movement within its functional range. That it is free to

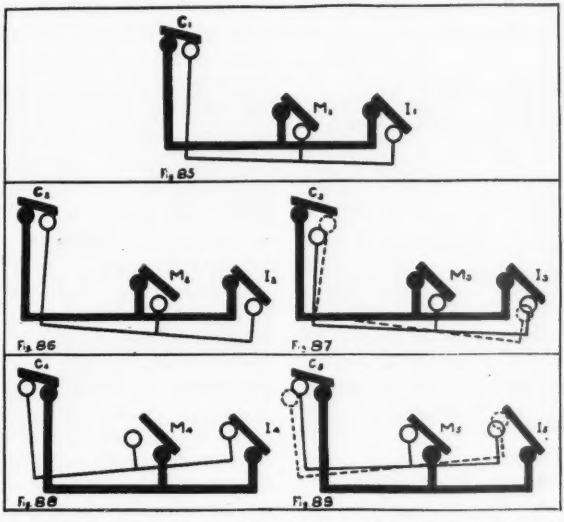

Fig. 38.—These figures show schematically condylar, molar and incisal mandibular points associated with their maxillary guiding surfaces. (Hanau.)

shift about under the guidance of the tooth cusps is not tenable.

Hanau[28] writes: "The floating condyle theory dissolves itself into a belief, too readily accepted on account of its adaptability to bridge the gap which exists in our limited understanding of mandibular movements in articulators . . . . the defects in articulation illustrated in Figures 39 and 40 would not concern us at all, if the floating condyle theory were correct."

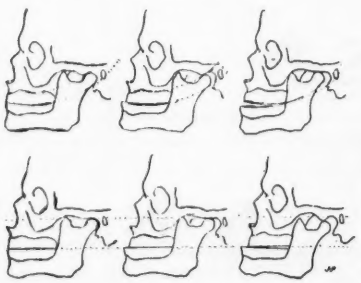

Fig. 39.—Schematic drawings showing the errors that may creep into a case through nonobservance of the condyle path and compensating curves. (Prothero.)

For the solution of the condylar function, we consider four views:

1. The condyle path is a supporting surface.

2. The condyle path is a guiding surface.

3. The condyle path is a limiting surface for movements of the condyle head toward its surface.

4. The condyle path is a defunct remnant of some primeval function or an eliminated function of early life of the individual.

In consideration of the first three views, the student is referred to the writings of such authorities as Gysi,[29] Wilson,[30] Williams,[31] Prentiss[32], Wright.[33] Making these three fine distinctions of movements, we find all three views apply to various stages of mandibular movements of the individual condyle head along its path, upon the surfaces and within the space of the condyle bicuspoid. The fourth view is a charitable interpretation of the theory of the floating condyle; i.e., that the condyle is become a defunct remnant, a functionless anatomic part. This terse statement is the ground upon which all average articulators are built and the ground upon which dentists stand who employ the average articulators for their denture construction. Only when the patient happens to fit the articulator can comfort and efficiency be obtained therefrom.

Adherents of the floating condyle theory claim that in the masticatory movements (articulation), the condyle heads move so little that such movements may be disregarded.

I would ask each of you to place your index fingers just in front of the tragi of your ears (both sides) and then move the mandibular incisors to an end-to-end relation with the maxillary incisors; repeat several times. Now make such movements as in masticating food, employing right and left alternately. If your tooth arrangement is such as is considered typical or normal, you will feel considerable movement of the con-

28. Hanau, R. L.: Dental Engineering, II. (Issued by subscription, and containing much valuable information.—R. R. G.)

29. Gysi, Alfred: Dent. Digest, 27: 283 (April) 1921.

30. Wilson, G. H.: Anatomy and Physics of the Temporomandibular Joint, J.A.D.A., 8: 236 (March) 1921.

31. Williams, J. L.: Geometry of Mandibular Movements, J.A.D.A., 7: 1004 (Dec.) 1920.

32. Prentiss, H. J.: Dent. Cosmos, 60: 505 (June) 1918.

33. Wright, W. H.: Deafness as Influenced by Malposition of the Jaws, J.A.D.A., 7: 979 (Dec.) 1920.

dyle head; and yet you have kept your teeth in articulation all the while you moved the mandible.

Could we but measure each of your movements, we would find such variations as were shown in the illustrations of condyle paths (Figs. 34 to 37), and few of your cases would conform to a bilateral 15, 28, 33 or 45 degree inclination as embodied in the average articulators.

Quoting Hanau again: "The question of importance is whether the walls of the glenoid fossa constitute one of the three named elements (supporting, guiding or limiting), or whether it is an anatomical unit which submits to modification without inconvenience or injury to the patient and without depreciating its own or other anatomical functions."

Prentiss,[32] Wright[33] and Monson[34] have shown conclusively that serious modifications do follow when normal articulation is lost or disturbed, even to the destruction of some of the parts.

Figure 38 and the following comments are taken from Hanau's "Dental Engineering":

These figures schematically show condylar, molar and incisal mandibular points associated with their maxillary guiding surfaces. The heavily shaded bar represents central occlusion of the masticatory surfaces associated with central relation of the mandible to the maxilla, normal.

Occlusions and relations after moving are shown by light and heavy line.

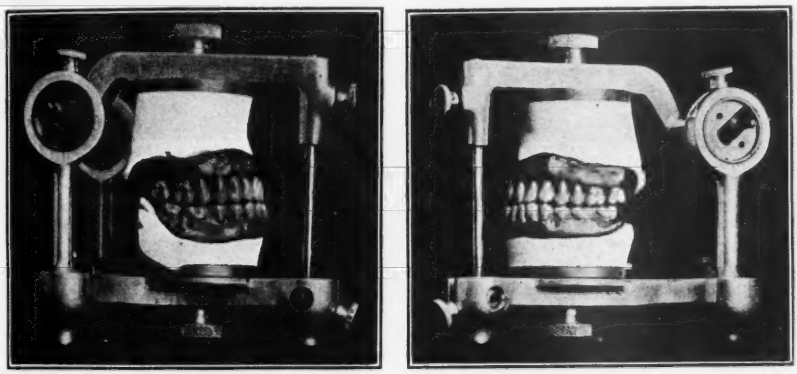

Fig. 40.—Dentures working in a mouth with steeper condyle paths than were built into the case.

The figure above shows harmonious maintenance of contact throughout, with central and protrusive occlusions and relations correctly associated.

The figure at left center shows loss of molar contact or incisal interference, with central occlusion and relation correctly associated while protrusive occlusion is off.

The figure at right center shows loss of either incisal or condyle head contacts; pivots on molar. Central occlusion and central relation are correctly associated while protrusive occlusion or protrusive relation, respectively, is off.

The figure at left below shows protrusive occlusion and relation properly associated, while central occlusion is off.

34. Monson, G. S.: Impaired Function as a Result of Closed Bite, J.A.D.A., 8: 833 (Oct.) 1921.

The figure at right below shows another phase of protrusive occlusion and relation, being correctly associated, while not employed. Both are the direct result of insufficient data or misuse of correct data.

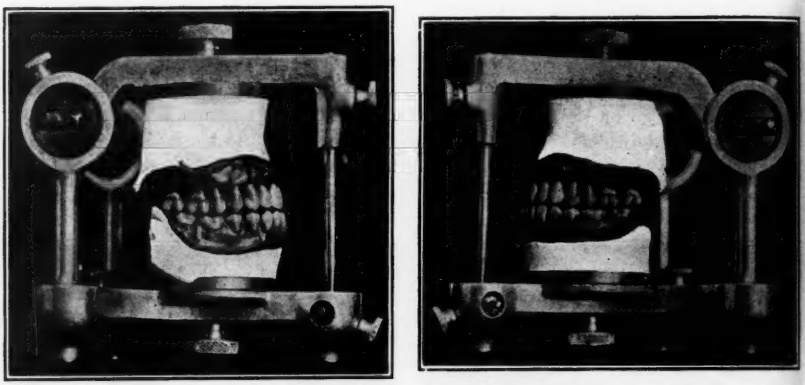

Fig. 41.—Dentures working in a mouth with flatter condyle paths than were built into the case.

central occlusion or central relation respectively is off.

Conditions similar to those shown below right and left were shown in Figures 24, 25 and 26. These conditions are typical of construction on "average articulators" or when face-bow technic is

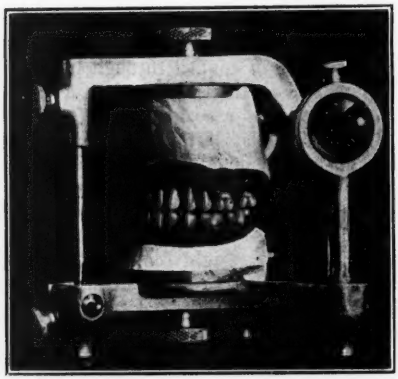

Fig. 42.—Result of improper orientation of casts in articulator and 35 degree paths on both sides; wrong paths and wrong position of casts.

Figure 39 is from Prothero's text, showing schematically the errors that may creep into a case through nonobservance of the condyle path and compensating curves. The upper left figure shows a quite normal case, which functions well, as in the upper middle; but lacks incisal contact, in protrusion if a flatter condyle path exists in the patient, as in the upper right.

The lower left figure shows a flat occlusal arrangement functioning well if the condyle path is nearly horizontal, as in the lower middle, but lacking molar contact in protrusion if the path happens to be steeper in the patient, as in the lower right.

Figure 39 graphically illustrates the relations between condyle path inclination, incisal guidance, cusp form and compensating curve.

The ultimate aim, the resultant of our efforts in denture construction, is a comfortable efficient denture. How may it be accomplished?

All are agreed that dentures should permit efficient masticatory movements

and conform to the anatomy of the patient. Assuming that a denture has been built and ground in on an articulator having a fixed condyle inclination of 35 degrees on both sides, what will happen when it is put into the mouth whose condyle paths are either less or greater than 35 degrees by 10 or 15 degrees? or worse yet, with 23 left and 45 right? Figures 40, 41, 42 show such results.

Figure 40 shows dentures working in a mouth with steeper condyle paths than built into the case. Figure 41 shows dentures working in a mouth with flatter condyle paths than built into the case. Figure 42 shows the result of improper orientation of casts in the articulator and 35 degree paths on both sides—wrong paths and wrong position of casts.

That patient is absolutely limited to an up-and-down chopping movement, such as might be afforded on "any barn door hinge" and no better; no lateral or

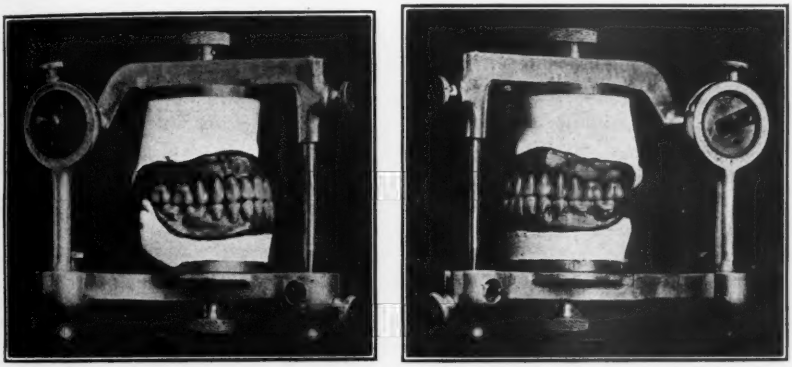

Fig. 43.—Incisal and molar balance on both right and left sides in protrusion; balanced contacts for this case.

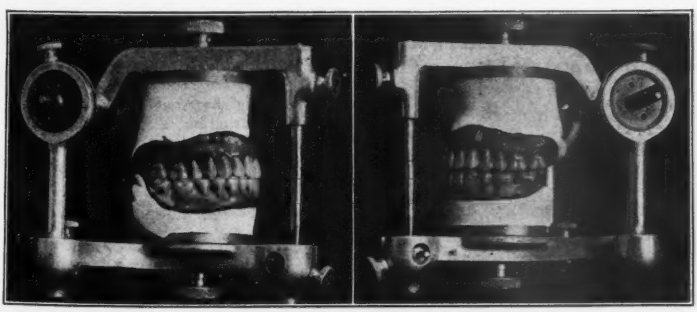

Fig. 44.—Balance in the working position; right second bicuspid and first molar in most intimate contact and left molars maintaining harmonious balancing contact. All incisors are practically out of contact during this comminuting action. Condyle paths for this case are flatter than usual, (18 right and 22 left), and the cusps are higher than usual; hence, there is not a pronounced compensating curve in the case.

comminuting movement is possible, for the masticatory surfaces will not move in harmony with the mandibular movements. The dentures and maxillomandibular relations coincide in but the single position of central occlusion.

Figures 43 and 44 show a proper articulation.

Figure 43 shows incisal and molar balance on both right and left sides in protrusion; and balanced contact for this case. Figure 44 shows balance in the working position, with the right second bicuspid and first molar in most intimate contact and left molars maintaining harmonious balancing contact. All incisors are practically out of contact during this comminuting action. The condyle paths for this case are flatter than the usual (18 right and 22 left), and the cusps are higher than usual; hence, there is not a pronounced compensating curve in the case. (See also Figure 31.)

In such conditions as shown in Figures 40, 41 and 42, the muscles of mastication are thrown out of balance. The direction of their force is changed, and one side or one muscle may be overloaded, while another fails to deliver its full capacity.

Whatever we may have done to alter one muscle action, a contra effect occurs in another. The situation is unfortunate but it remains a fact.

There are just a few factors whose careful observance tend to greater denture success.

Bonwill recognized the relation between the length of overbite, compensating curves, arch form, and in a way, arch position; and, in his later years, he admitted the relation of the condyle path. Walker, Kerr, Grittman, Snow and Christensen recognized the inseparable relation of the four, and Snow definitely added the factor of arch position. Gysi, in his incomparable researches, discovered that additional factors were the tooth form and cusp form and the lateral inclination of the condyle path. This last factor was hinted at by Walker with his "fulcrumage points."

There are other factors, such as the consideration and measurement of the effect of resiliency as given by

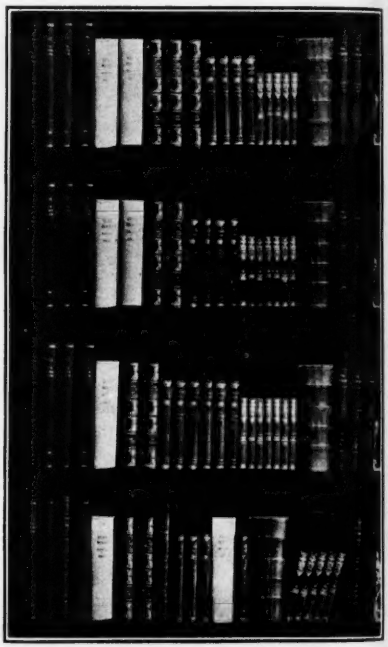

Fig. 45.—A shelf of eight kinds of books, illustrating the eight factors in successful denture construction, and the combinations to be obtained by making changes in the relative value of any of the eight components.

Hanau. All have a great bearing and deserve the utmost consideration in full denture prosthesis.

By most prosthetists, their essential nature and value are not given the attention that their importance demands, because confusion results in most minds when so many factors enter into the problem.

The eight principal factors in denture

construction are (1) condylar guidance, (2) ridge form, (3) ridge position, (4) resilient effect of the tissues, (5) tooth form, (6) cusp form, (7) incisal guidance, and (8) compensating curves. They can be and should be nicely blended or balanced to produce desirable results.

Why wonder that the average denture is a failure when the dentist has considered only items 2, 5 and 6?

Every patient brings to us: (1) condylar guidance, (2) ridge form, (3) ridge position and (4) resilient effect of the tissues.

The dentist provides: (5) tooth form, (6) cusp form, (7) incisal guidance and (8) compensating curves.

The dentist's success depends on his harmonizing his four factors with the four brought by the patient. He must observe all eight of these factors and remember that the first four cannot be disregarded without impairing the efficiency of his case.

The application in denture prosthesis is given in the paper of Boyce, which was read before the Chicago Dental Society in January, 1923.

Figure 45 shows how readily we may consider the variable combinations that may be obtained by making changes in the relative value of any of the eight components. This figure shows how we may vary the combination of eight factors and yet maintain the same sum total. Here we have a 3-foot shelf of books of eight different kinds. Considering the top row as normal, we can use less of the fourth factor and inject more of the sixth to keep the shelf full (next to top row); or again, less of the third by adding more of the fifth to maintain a full shelf, as in next to the bottom row. The lower row illustrates confusion resulting from disordered calculation or inharmonious combinations with probable deficiency of some factor.

CONCLUSION

All that has been said appeals to you, possibly, as the statement of a complicated problem. But it is not if we consider but one factor at the time. The solution is difficult only when an effort is made to consider three of four factors at one time.

On entering dental college, one proceeds toward graduation time by slow steps, mastering one thing and then another in sequence until ability is acquired and demonstrated, bringing a diploma certifying to one's attainments.

With a college course back of the dentist—with years of practical experience added thereto—he is qualified to take another advance step now, and will if he sincerely desires to serve his patients in the very best manner. Nothing must be left to empiricism or guesswork.

Paraphrasing a statement of Crile (he spoke of surgery): Good denture prosthesis is the exponent of no single method. It recognizes the anatomic and environmental situations. Good denture prosthesis does not substitute an easy formula for principles.

PROGRESSIVE AND RATIONAL DENTISTRY*

By HART J. GOSLEE, B.S., D.D.S., F.A.C.D., Chicago, Illinois

FELLOWS of the Odontographic Society of Chicago: We have been called together and have assembled here this evening for the purpose of effecting the reorganization of this society, and to me has been assigned the honor, and the pleasant, though I fear unmerited, duty of bringing to you a message which may in some manner convey the dreams, hopes, ambitions and purposes of those loyal fellows who first conceived, and then brought about, this reorganization.

The original Odontographic Society of Chicago was organized primarily as a study club, in 1887, by the undergraduates of the Chicago College of Dental Surgery.

Later, and soon after the graduation of its original members, its possible field of usefulness was broadened by the addition to its membership of all desirable and equally ambitious members of the alumni association of this same institution.

This society, therefore, was conceived and born in a family sub-group, but this group had received such inspiration from its progenitors, and was so broad and liberal in its ambitions and so unselfish in its aims and objectives, as to plant, unconsciously, perhaps, the seed of rational progress, of unanimity of purpose and of good fellowship. The seed were planted in fertile soil, and promptly took root and grew.

The growth became so sturdy that in a few years the graduates of other colleges sought enrollment in the membership of this organization. The spirit of unselfishness and of good fellowship which had been such a dominant factor in the growth and usefulness of this Society up to this time, and which clung to it through all of the years of its existence, was again cheerfully displayed, the graduates of other institutions were admitted to membership, and a more cosmopolitan organization was created.

From this point on, the same indomitable spirit of activity and progress, which was a heritage, continued, and the society grew until it became a power in dentistry, and the largest local dental society in the world. It continued to grow until its name and work was recognized and heralded all over the world. Indeed, it may be said with truthfulness and modesty, that the work of this society did much to raise the standard of dentistry all over the world, and to place Chicago in a conspicuous position in dentistry and in dental society and dental educational work throughout the world.

And then came a time when it was

*President's address delivered on the occasion of the reorganization of the Odontographic Society of Chicago, March 10, 1925.

thought by many that the best interests of the profession in Chicago might possibly be served best by having but one society, and by effecting a consolidation of this society with the older, but somewhat less active Chicago Dental Society, and that the merging of the two would result in one whose record for activity and usefulness might be more in keeping with the traditions, spirit and progress so characteristic of our city itself, and of the profession in our city.

This consolidation was effected in 1907, and the hyphenated name Chicago-Odontographic Society was adopted. Under this name, the society continued its mission of active usefulness until 1910, when, for the purpose of aiding in the reorganization of the American Dental Association, and of becoming a component thereof, it was again reorganized, this time under the old name of "the Chicago Dental Society."

Many of the original and older members of the Chicago-Odontographic Society were reluctant to see this once prominent name relinquished, and the identity of this society lost completely and entirely. Its many years of usefulness were looked on with a keen sense of pride, and yet, because of that inbred spirit of unselfish devotion to what seemed to be for the best interests of the profession in our city, feelings of pride and of regret were submerged and loyal support was given.

And still as the Chicago Dental Society has grown in membership, and as the horizon of its field of usefulness has become greater and broader, it has seemed to many of us that something, we don't know just what, was, and is, missing, and that there might still be a place of usefulness for a smaller organization; an organization in which the membership can get into closer relationship one with the other; in which this closer touch, this personal contact, might inspire and develop an even greater field of individual usefulness among the membership of the smaller body than would be even proportionally possible in the larger organization, and, too, without in any way antagonizing the larger body, or interfering with its continued growth and progress.

Those who first conceived of, and who are directly responsible for, this reorganization, believe honestly and sincerely that there is still and now a place of usefulness for the rejuvenated Odontographic Society of Chicago. Actuated by these sentiments, they took it on themselves to make application to the secretary of state for the reissuance of the original charter. The application signed by the original signers of the original charter, J. E. Keefe, George N. West, H. H. Wilson, C. E. Bentley and T. A. Broadbent, was acted on promptly and favorably, and a new charter, under date of Dec. 31, 1924, was granted.

In filing the application, the law required that a board of directors be named, and that these names appear on the charter. To conform with this requirement, a meeting was called and the following were elected to act as a board of directors: D. C. Bacon, E. W. Elliott, C. E. Jones, P. B. D. Idler and C. F. B. Stowell.

This Board met from time to time and finally selected twenty-five charter members. This group, all keen, active and enthusiastic men, met on Tuesday evening, February 24, and effected a temporary organization.

And now, my friends, you know something of the early history of the

Odontographic Society of Chicago, a name rich in cherished traditions, and symbolic of progress, activity and good fellowship; and you know something of the thoughts and motives, the desires and ambitions that reposed in the hearts and minds of those who have made it possible for this society to be reborn and who have selected you to be present tonight and lend a helping hand at the christening.

And yet, now that the child is born, and that honest, sturdy and ambitious parentage and cherished traditions as a heritage are evident, what aims, objects and purposes must be both transplanted and implanted in order to insure a healthy growth, and a long and useful life?

In the onward march of progress, and in the pursuit of scientific knowledge today, there is no place for the laggard. No one has a right to feel that the world owes him anything. And no one should accept and profit by the work of others, without at least making an effort to contribute his portion, however large or small it may be, in return.

If this is rational philosophy as applied to the individual, then by the same token there is no place for the laggard society, or organization, of any kind. The wheels of progress are constantly moving and moving so rapidly that any individual, or any group of individuals, cannot afford to become laggards. All must move and move quickly, and they must keep up with the procession or they will soon be left behind, and inactivity and lack of energy in any walk of life is a sure road to helplessness, uselessness and oblivion.

Notwithstanding the wonderful progress that is now being made, particularly in the arts and sciences, there are still new fields to be opened and cultivated and much work to be done. Hence, there is a place for every bright, honest, ambitious and energetic man and woman as an individual, and there is a place for every organized group of men and women whose organized efforts may be conscientiously directed toward a goal that stands for the advancement and common good of all, for progress and achievement.

With these thoughts in mind, and with this goal ever in the perspective, those who builded the sturdy foundation upon which this original organization rested so long and so firmly feel that this superstructure, rebuilt of similar texture and with similar objectives, will again make and fill a place of such usefulness as will insure it a long and healthy life.

To hope for and to obtain a long and useful life, any scientific organization, set, body or group must be free from factions or friction, from antagonism or jealousy, from politics or perfidy. Its members must place high ideals and unselfishness above everything else and must be inspired to work as a single unit.

While politics may be a necessary evil in governmental, industrial and commercial organizations, politics does not contribute much to statesmanship or to scientific advancement. For these reasons, my friends, I want to state right now and with all of the emphasis at my command that the Odontographic Society of Chicago does not and will not constitute a principality of intrigue, nor a dominion of politicians.

The world of science owes nothing to politics nor to politicians. In the electrical world, humanity owes much and will forever be indebted to four outstanding names—Morse, Bell, Edison and Marconi. In the world of

medical science, humanity owes much and must ever pay tribute also to four outstanding names—Koch, Pasteur, Lister and Röntgen. And the world and humanity owes much to dental science and dental science owes much also to four outstanding names—to Harris, the father of American dentistry; to Wells, the father of anesthesia; to Garretson, the father of oral surgery, and to Black, the father of modern dental science.

Is it not singular that humanity should and does owe so much to the same number of outstanding names in each of these sciences? Verily, these men constitute the twelve disciples in the book of human progress. Politics never aided the bearers of these illustrious names, nor did politics in any way inspire them in their dreams, ideals, ambitions and achievements. Politics, therefore, should be beneath the dignity of all on whom humanity and scientific progress and achievement must depend in the future.

As a society, it is our firm and honest belief that we can be most useful in, and contribute most successfully to, the scientific progress of dentistry by constituting ourselves an absolutely nonsectarian organization, free from college, fraternity or political affiliations or entanglements of any kind.

We do not want in our membership those who have a chip on the shoulder or an ax to grind; nor do we want those who are interested mainly in promulgating their own personal views, or any form of commercial propaganda.

We do not want to be known as a so-called silk stocking organization, or as an organization of highbrows or lowbrows or of scientific research workers. Nor do we want to be known as a clique or group or set of egotists, or as a bunch of disgruntled or pessimistic bolshevists.

We do not believe in being carried away on the wings of fads or fancies; nor do we believe that radicalism along any given line contributes to progress in any way other, perhaps, than to stimulate the conservative thinker and worker to seek, find and establish the truth.

Along these lines, there are many more or less radical teachings with which we think no rational progressive thinker can agree. We do not believe that the presence of an acute apical or pericemental disturbance or roentgenographic evidence of some slight past or present pathologic condition of a root-end necessarily condemns a tooth; nor do we support or subscribe to the tenets of the so-called 100 per cent club and demand that only teeth having vital pulps be allowed to remain to grace the portal of the human economy.

We do not believe that extraction is the only means by which incipient pyorrhea alveolaris may be cured; that the ammoniac silver nitrate method of treatment is the only method by means of which the root canals of teeth may be successfully and permanently sterilized and filled; nor do we believe that the roentgenogram is always an infallible and absolutely dependable means of making correct diagnosis.

We do not believe that the cast gold inlay is the only method by which cavities in teeth may be successfully filled; or that the gold telescope crown or the porcelain jacket crown are the only means of restoring the crowns of natural teeth. Nor do we believe that the so-called three-quarter crown is the only method of successfully obtaining attachment for dental bridgework.

We do not believe that there is "no

place in dentistry for fixed bridgework," or that the partial immobilization of supporting teeth will necessarily result in their immediate loss, or even necessarily hasten their loss. Nor do we believe that fixed bridgework, or removable bridgework, either one, constitutes the only method by which missing teeth can be successfully replaced; nor do we believe that cast clasps should be used everywhere.

We do not believe that Gysi or Hall or Munson has contributed all that is to be contributed along the lines of the anatomic articulation of artificial teeth, or the technic of denture construction, and we hope they have not.

We do not believe that dentistry should be divided entirely into specialties and practiced only by specialists; nor do we believe that the conscientious skilful general practitioner or the family dentist or the family doctor should ever cease to be.

We do not believe that the dentist should necessarily be a graduate in medicine or that the degree of D.D.S., should be dropped and the one degree of M.D. be used and made to cover the entire fields of medicine and dentistry. Nor do we believe that the medical practitioner, trained and experienced only in medicine, should attempt the interpretation of dental roentgenograms or should presume to dictate to the trained dentist what the latter should or should not do.

We do not believe that the degree of D.S.S. is beneath the dignity of any man's ambitions, but we do admit that graduation in medicine would be and is a valuable adjunct to graduation in dentistry, and that the possession of both degrees would make for better dentists and better dentistry for the future.

But, and by the same token, would not the possession of the dental degree also broaden the physician of the future? It would. And yet until such time as medical science and dental science shall have reached the Elysian fields of preventive medicine and preventive dentistry, the physician remains chiefly the guardian of disease, while the dentist is gradually becoming, in large part, the guardian of health.

Undoubtedly, the well educated and well trained dentist should and will work *with* the physician, but not necessarily *for* him, and we do not believe that intelligent and scientifically correct diagnosis is to obtain without the respectful interchange of ideas and opinions and the cordial cooperation of physician and dentist.

We believe that these thoughts, views and expressions in the composite are rational and progressive and that they will meet with the unanimous and unqualified endorsement of the thinking members of the dental profession.

And now as we stand upon the threshold of a rejuvenated era of activity tonight, scan the horizon of dentistry unblushingly, look with pride on our past history, and think calmly but enthusiastically of the work before us, let us speak in the same rational way of some of the things that we *do* believe.

We believe that dentistry is a wonderful profession and that dental science and dental art has made wonderful progress during the past decade. And while we look with pride on this progress, we believe that there is still much to be done and many problems yet to be solved; problems which bear on health and life and which only a high order of intelligence and of scientific training, combined with unselfish, self-sacrific-

ing enthusiasm and devotion, will ever solve.

We believe that the wonderful progress that dentistry has made during the past ten or more years has been made possible, largely, by the almost omnipotent eye given to us by the discovery and application of the roentgen ray.

This discovery, the product of a trained, intellectual, scientific mind, has revolutionized the practice of dentistry. By exposing and permitting us to see abnormal and pathologic conditions, hitherto hidden, roentgenography has created a demand for a higher and broader knowledge of pathology, and pathology was the one weak spot of the dentistry of the past.

This recognition and keener appreciation of the value of a greater knowledge of pathology, and the possession of this knowledge, has placed the dentist in a position to aid materially in the prevention and cure of disease, and thus in turn to add to the health and longevity of the human family.

We believe that in the not distant future science is going to lead us at least to the borderline of the Elysian fields of preventive dentistry—that *diet* and *oral hygiene* are the satellites which will illuminate the pathway to a realization of this dream, and therefore that dietitians and dental hygienists have a wonderful field of effort before them.

We believe that the scientific studies of the dietitian must necessarily lead to proper nutrition, and that proper nutrition will correct faulty metabolism and in time insure greater health and better teeth.

We believe that the work of the intelligent and well trained dental hygienist is even more important than that of almost any other specialist in dentistry, and we believe that the time will come, and come soon, when the dental hygienist will constitute an important part of the office and of the practice of every progressive dentist.

We believe that, except in emergencies and for the immediate relief of pain, the patient should first be required to pass through the hands of a trained hygienist and receive prophylactic service and preliminary examination, and that this should be followed by a careful checking up and charting of the requirements of the case and the making of roentgenograms, before diagnosis or actual operative procedure is attempted.

We believe that this work, with full instructions as to its importance, can and will be done better by the trained hygienist than by the dentist himself.

We believe, too, that, notwithstanding the possibilities of preventive dentistry, the dentist need have no fear of the demands on him for his services becoming less frequent or less important, because there will always be a field for surgical, reparative and constructive talents. Accidents, illness, incurable pathologic conditions, congenital abnormalities and the ravages of time and neglect and abuse will always make even greater and increasing demands on him and his time and his skill.

We believe that the natural teeth have an intrinsic value far beyond the possibilities of artificial substitutes of any form, and that every safe and rational effort to save the natural teeth should be made always. We also believe that every single tooth in the normal denture is necessary to normal function and that when one is lost for any reason it should be replaced before

injury to adjacent and opposing teeth results.

We believe that gold foil fillings still have a place of usefulness; that the cast gold inlay and even the porcelain inlay has its place; that the silicates have their places and that amalgam and cement and even guttapercha each has its place, but we also believe that no single one of these substances is applicable universally.

In fact, we believe in *rational dentistry*. We stand for progress along rational lines, and for the inculcation and dissemination of the spirit of progress and of good fellowship always.

We believe in supporting every local and national movement, either legislative or educational, that will make dentistry bigger and broader and better and will aid in the education and better protection of the public.

We believe in the compulsory examination of the teeth in the mouths of the children in our public schools, at regular and more or less frequent intervals, and we believe in the establishment of municipal dental clinics in which the teeth of indigent and needy children may receive prompt and proper attention.

Indeed, we believe in all outstanding and uplifting movements so strongly as to pledge our encouragement, support and assistance at all times. And, if any movement is ever to be made to educate the newspaper reporters and writers that the normal denture embraces teeth other than molars, and that the armamentarium of the modern dentist now includes more than forceps and buzzers, we also cheerfully pledge our support.

And now, my friends, just a few words as to our plans and policies. Membership in the Odontographic Society of Chicago will be by invitation only. This is thought to be desirable because it will insure harmony in our ranks, and harmony will inspire enthusiasm, activity and good fellowship.

Membership in the American Dental Association will be the requirement of elegibility. There will be no honorary or nonresident memberships in the society. All will be active members. The constitution and by-laws provide for the conferring of a fellowship on such members of the profession as this society may care to thus honor at any time.

My friends, the Odontographic Society of Chicago is now reorganized. It has a place of usefulness. May it live up to its traditions. May its work be a credit to the profession, to the city and to its founders. And may it be active, progressive and rational always.

"Procede sed semper sano animo."

ETHYLENE IN ORAL SURGERY

By ANSEL M. CAINE, M.D., New Orleans, Louisiana

(Read before the American Society of Oral Surgeons and Exodontists, Dallas, Texas, November 6-8, 1924)

THE perfect anesthetic agent is still undiscovered. Constant work is being done all over the world with its discovery the goal. Each advance is welcomed, and we are more and more heartened to go ahead.

Last year brought us ethylene, and with it, the knowledge that all of that group of hydrocarbons, beginning with ethylene and going up the series, are anesthetic agents. This year, one of these has been studied, and is being further studied by Dr. Halsey of Tulane University. I refer to propylene. So far, this work has been handicapped by the inability to secure a pure propylene, but from the results obtained with the product Dr. Halsey has used, there are hopes that propylene will surpass ethylene. Then comes butylene, which is the next step up from propylene, with its undetermined possibilities.

Today, we want to say a few words as to ethylene in oral surgery, comparing it with nitrous oxid, as a well known standard:

Both of these agents boil at a very low temperature. Both can be obtained almost absolutely pure at reasonable cost. Both are very quick in producing anesthesia. Recovery of the patient from the influence of each is prompt. Both are delivered in steel cylinders under high pressure. They can be administered with the same apparatus. Neither seems to cause irritation of lungs, or to affect the heart muscle, the kidney substance or the liver cells.

There is often a good deal of excitement in a patient going under nitrous oxid anesthesia. There is a remarkable absence of excitement in one going under ethylene anesthesia.

Often it is necessary to keep the patient in cyanosis, more or less marked, in nitrous oxid anesthesia, in order to maintain the required state of quietude and anesthesia. Cyanosis increases the size of the brain, as shown by Teter some years ago, and necessarily causes increased pressure on the vital centers of the brain. Some of these are especially susceptible to pressure and may be more or less permanently injured when subjected to pressure associated with enlargement of the brain, due to cyanosis from suboxygenation in saturation.

In giving ethylene, it is seldom necessary to produce cyanosis in the patient, and when suboxygenation be-

comes necessary, it is very brief, and the patient can soon be brought to a pink condition again.

Fair relaxation is necessary to the oral operator in order for him to do his best work. This condition is maintained fairly easily with ethylene, while with nitrous oxid it is much harder.

Nitrous oxid is not inflammable, which is a great advantage in some cases. In fact, its inflammability bars ethylene entirely sometimes. Whenever the actual cautery is to be used, or diathermy for growths about the face and mouth, where heat and coagulation are the aim; or in the presence of any other electric machine where sparks are common; or where there are open fires or electric heaters, ethylene is contraindicated because of this explosive feature. The higher the oxygen percentage, up to 90 per cent, the greater the explosibility. While with low percentage of ogygen, ethylene will burn from the end of the tube like illuminating gas from a jet, with a high percentage, explosion will take place back in the tube, or even in the lung of the patient. This explosive quality of ethylene is more likely to be manifested in a small dental office than in a large operating room where diffusion will be greater. Then, too, in oral surgery a greater amount of gas is used owing to the necessary positive pressure in the machine to overcome the handicap of an open mouth. This results in a greater concentration of gas in the room, bringing up the percentage to the necessary explosive point. Another thing, with positive pressure and gas escaping from the mouth in a stream, this gas will carry a good distance so that if there is a cautery or flame within 6 feet (possibly more), it is dangerous. By no means let familiarity breed contempt in this matter of the explosiveness of ethylene.

While the recovery from both nitrous oxid and ethylene anesthesia is prompt, as far as consciousness is concerned, it has been our experience that there has been more nausea and vomiting following the use of ethylene than after nitrous oxid anesthesia. This condition has improved considerably in the past two or three months, owing to the improvement in the ethylene obtainable. A piece of ice used to iron the back of the neck and base of the skull relieves this condition to some extent.

Ethylene is safer in diabetes, as it is the only agent in common use for general anesthesia that does not lower the carbon-dioxid combining power of the blood.

Ethylene is very satisfactory to both the anesthetist and the operator in oral surgery, especially in dentistry. In tonsil operations, the throat reflexes can be abolished very well, which is essential for the best work. The patient is usually quiet and relaxed, even when the color is normal, although there is occasional retching. Often 15 or 20 per cent oxygen can be used throughout, after anesthesia is established. We proceed just as with nitrous oxid, except for starting with 10 per cent oxygen. After the patient is unconscious, if relaxation is

slow, we administer a few breaths of pure gas and then switch back to 10 per cent. If anesthesia is satisfactory and the color is good, we keep this percentage, but if the color is dark, we increase the oxygen to the point where both anesthesia and color are good. If the reflexes return, we decrease to the point where anesthesia is good. Retching usually takes place if the throat reflexes are present. Sometimes reflexes are abolished and anesthesia is improved when oxygen is increased. I have had this to take place quite a few times. One recent case, an appendicectomy, is fresh in my mind. The patient resisted and was quite rigid under the usual 10 to 15 per cent of oxygen, and was cyanosed. We worked above and below this for a while, finally raising the percentage of oxygen gradually to 60, with 40 per cent ethylene, at which point anesthesia was at its best, and cyanosis had finally disappeared. Of course this was an exceptional case, but when using ethylene constantly, this expedient works fairly often.

I have had occasion to anesthetize some patients for oral surgery whom I had previously anesthetized with nitrous oxid for similar work. There has been a striking difference in the smoothness of the anesthesia, but the after effects have not always been so good.

Children are much more easily handled with ethylene than with nitrous oxid. This applies to both oral and general surgery.

SUMMARY

Ethylene does not act uniformly well in all cases and causes too much nausea to be ideal.

It is explosive to an extent that demands constant care.

With these exceptions, it is good, and, after careful observation, I am persuaded that properly administered, it is the general anesthetic agent of choice in most oral surgery performed by dentists.

DISCUSSION

Roy S. Hopkinson, Milwaukee, Wis: Ethylene, a new anesthetic, must undergo the scrutiny of conscientious, careful anesthetists in a large series of cases before a fair comparison can be made with the time honored admittedly safe anesthetic—nitrous oxid and oxygen. I believe it is a fact that the limitations of nitrous oxid and oxygen, with or without ether, differ greatly in the hands of the expert and the average anesthetist, and what is true of this anesthetic is unquestionably true of ethylene. Dr. Caine states, in the beginning of his paper, that "The perfect anesthetic agent is still undiscovered," which I believe cannot be disputed; but whether the ideal anesthetic without one or more objectionable features known to be true of the anesthetics now in use will ever be reached is doubtful. For many years, I have given nitrous oxid-oxygen in combination with ether and without it, with gratifying results, and with no serious postoperative complications. These anesthetics were given at the hospital for cases listed as "bad or poor surgical risks." Yet there are many sections of the country today and many hospitals in which the obvious efficiency and safety of nitrous oxid and oxygen as an anesthetic is not appreciated. The recommendation of ethylene to the profession as a substitute for nitrous oxid and oxygen has, in the limited time that it has been used, caused many reports that prohibit its general acceptance to the men who follow our specialty. Ethylene has objectionable features as an anesthetic which might not be considered of importance in the hospital, but which certainly argue against its universal adoption in the office of the specialist. Two hospitals in

Milwaukee have prohibited its use and have posted instructions to the staff that it must not be used. It is admitted by Dr. Caine and others who have used this anesthetic that it is exceedingly explosive and requires precautions to prevent serious accidents, and accidents have occurred which have been of a serious nature. The odor of ethylene is disagreeable. It diffuses rapidly in the operating room and remains on the clothing and on the patient's breath for a long time. This second objection alone is sufficient to make its use in office practice objectionable. It produces more nausea and depression following its administration than nitrous oxid and oxygen, and while the nausea is seldom serious in character, it produces a very sick and very displeased patient. Ask yourself how often a referred patient receives proper instruction as to diet before presenting himself at your office for oral surgery. Your experience will answer: "Very seldom." To quote a recent publication by a member of our society: "We found, while using ethylene exclusively, that we had from six to ten patients a day who were seriously nauseated." This percentage may not have been the experience of others with this anesthetic, but it certainly does not add anything to recommend its use to the specialist. Ethylene, it is claimed, produces relaxation that cannot be obtained uniformly with nitrous oxid and oxygen, but this factor is more important in major surgery than in oral surgery. The practice of some operators in using a great deal of pressure in operating on the mouth certainly does not call for relaxation during general anesthesia without the added risk of accidents. Since the improvement of the technic and more or less universal adoption of block anesthesia in oral surgery, the small percentage of cases that cannot be efficiently handled under local anesthesia have been reduced to a minimum. The careful conscientious operator seeking to give his patients the best service does not today seriously concern himself with new general anesthetics, but looks forward continually to a more perfect technic in local anesthesia. The present practice adopted by many operators of dividing operative procedures of a surgical nature into several steps has reacted with great benefit to the patient, and with most gratifying results from the standpoint of the oral surgeon. The conclusion that "Ethylene, properly administered, is the general anesthetic agent of choice in most oral surgery," I do not believe is borne out either by the facts presented in Dr. Caine's paper or the reports of members of our profession who have used this anesthetic.

Edward L. Moravec, Cedar Rapids, Iowa: I agree that ethylene is not the panacea for all diseases as far as anesthesia is concerned. It merely adds greater selectivity. We simply have one more anesthetic to select from. For instance, I don't believe a depressed case is the case for ethylene, as the ethylene acts more or less as does chloroform. It is somewhat of a depressant. Nitrous oxid acts more as does ether, being somewhat of a stimulant. Speaking of cyanosis and forcing anesthesia, has it not been established that the lung can take only a certain amount of anesthetic? Each breath will fill the lungs to capacity. Forcing anesthesia means simply washing or overventilating. I don't believe cyanosis is indicated or necessary or desirable at any time. I aim in all of my anesthetic work to prevent or not permit cyanosis. If we have cases in which we feel it is absolutely necessary to have cyanosis, we had better add a synergist of some other type, either ether, in hospital work (that has been our habit) or anesthol. Dr. Ecker, of New York, has, I believe, worked a good deal on that. I tried that in my office for a long while, and it works very satisfactorily. Since ethylene has come in, I am using it, as I mentioned yesterday, as a synergist. I believe one gets away from all the bad effects mentioned, the bad odor, etc., because it is in use only for such a short time. When your patients are not so deeply anesthetized as desired if they are given that little final knockout blow and are put under a little more deeply than in the ordinary anesthesia, and then allowed to come back, a much smoother anesthesia can be obtained for the rest of the time.

After all, our patient is the barometer.

There is nothing else that makes any difference. We speak of different percentages of oxygen. I don't think it makes any difference what percentage the machine indicates. It is what the percentage on your patient indicates, and one must be able to read the needs of oxygen in the patient.

The personal equation, I think, is one of the biggest things in anesthetic work. First, one must establish the confidence of the patient, and if the dentist has confidence in himself and the patient has confidence in him, half the battle is won; a knowledge of the subject being, of course, taken for granted.

There are some things that require particular attention, the selection of the anesthetic and the examination of the patient. The breath holding test is a simple and very efficient means of getting a line on the patient. It is easy to determine the extent of the breath holding, by covering the mouth, and asking the patient to hold his nose and hold his breath, and noting how soon he removes the fingers from the nose. I believe that I am safe in saying that there isn't one in the room who, trying it the first time, will hold his breath sixty seconds. The average patient will hold it anywhere from ten to twenty or twenty-five seconds. One can, in a little while develop the ability to hold it a minute and a half or two minutes. Great care must be taken in anesthetizing patients that can hold the breath for only ten seconds.

I don't believe that ethylene will replace nitrous oxid, but there are types of cases in which it is indicated.

Dr. Caine (closing): I was trying to be extremely conservative in the paper that I read. I don't think ethylene is at all ideal and I think nitrous oxid is a long way from being ideal. I say that after a great deal of experience in major surgery as well as in oral surgery. I gave nothing else practically but nitrous oxid without ether for several years in major surgery, and I have been using ethylene for the last sixteen months. The first time I gave it was July 19, 1923. I have used it for all kinds of surgery, everything that is found in a busy clinic.

Now regarding the nausea, I want to say that the reports are going to be much better regarding nausea. My results have been much better in the last two months because I have had better ethylene during that time. In the Tulane Dental Clinic, we have a big cylinder of old ethylene; it is bad; it is very irritating to the nostrils and people are as nauseated as they can be from its use. But the new gas we get doesn't smell like the same gas at all. In the last gas, you who use ethylene must have noticed the lack of any really disagreeable odor, while the results are just as much better as far as postanesthetic nausea is concerned.

Dr. Moravec was exactly right regarding the percentage: the patient is the index. I illustrated that by the case of the Spaniard I spoke of, with the inflamed appendix that had to be removed. He was 30 years old, and he was cyanosed until 60 per cent oxygen was given.

THE OCCURRENCE OF CLASMATOCYTES IN ORAL CONDITIONS RELATED TO PYORRHEA*

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MANY years ago, Metchnikoff,[1] in the course of his work in the field of microscopic comparative anatomy, came to the conclusion that there are found both in lower and higher forms of life cells possessing the power of phagocytosis. Some of these he denominated macrophages. It was his belief that all such cells have ability to engorge foreign matter. Ranvier,[2] after an extensive series of experiments, described certain relatively large cells from varying locations in the frog, rabbit, rat and cat. These, which he called clasmatocytes, he found particularly numerous on the peritoneal wall and omentum. He stated, furthermore, that they are present in serous exudate. The latter observation was confirmed by Cunningham,[3] using trypan blue, carmine and silver precipitate.

Our information regarding these cells is derived principally from a vital staining technic. Although the clasmatocytes may be seen in tissue preparations stained by hematoxylin and eosin, this technic is unreliable. They may be mistaken even by a most experienced observer for other cells of similar appearance but utterly different. Therefore, their ability to take up certain nontoxic stains or other inert but visible material has been utilized. If the experimental animal is drenched with a number of injections of large volumes of the stain in solution, teased preparations will reveal the clasmatocytes when present. The stain is visible in vacuoles if the cell is still alive; but if it is dead, merely a general and diffuse staining is seen. Clasmatocytes may be observed also in warm smear preparations. In this case, they may be rendered visible microscopically by application of a weak solution of neutral red. To Ribbert,[4] we owe much of our knowledge regarding vital staining and its effects on the cells in question. He showed that carmine injected into the experimental animal is not entirely eliminated. Some of it is

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1. Metchnikoff, E.: Immunity in Infective Disease; translated by Binnie, Cambridge, 1907.

2. Ranvier, M. L.: Des Clasmatocytes. Compt. Rend. Acad. des Sc., 110: 165-169, 1890.

3. Cunningham, R. S.: The Changes in the Omentum of the Rabbit During Mild Irritations; with Especial Reference to the Specificity of the Mesothelium, Bull. Johns Hopkins Hosp., 33: 257-265 July, 1922.

4. Ribbert, H.: Die Abscheidung intravenös injizierten gelösten Karmins in den Geweben, Zeit. f. allegemeine Physiol., 5: 201-214, 1904.

retained by certain cells or rather by a whole system of cells that are found in endothelium, the lymphatics, the bone marrow and connective tissue. He recognized them as the clasmatocytes of Ranvier.[2]

There are many authors whose work indicates that these large motile cells of Ranvier,[2] which have since been pictured by others under a great variety of synonyms, are phagocytic for bacterial forms. Among these investigators may be mentioned particularly Salimbeni,[5] who found the clasmatocytes active in the horse in cases of infection by streptococcus. Buxton and Torrey[6] also depict this form of cell engorged with *B. typhosus* and *B. coli.* Goldmann[7] proved its ability to phagocytose tuberculosis. In addition, the work of Evans and Scott[8] proves without doubt the extraordinary ability of these cells to take up colloidal particles in the form of dyestuffs.

There exists opinion that the clasmatocyte is more active than the polymorphonuclear in destruction of invading pathogenic micro-organisms. Buxton and Torrey[6] attribute little significance to the neutrophils in disposing of bacteria in the peritoneum. Murphy and Ellis,[9] by means of the use of roentgen-rays on mice, show that destruction of lymphoid tissue lowers the resistance of these animals to tuberculosis. Gay and Morrison[10] have proved lately that it is the clasmatocyte rather than the polymorphonuclear that is effective within the pleural cavity against streptococcic infection. Indeed, Simon[11] has shown that the exudate produced by injection of aleuronat offers a satisfactory medium for the cultivation of a variety of strains of the streptococcus. This exudate is characterized by the presence of large numbers of the polymorphonuclear leukocyte.

Inflammation is a defense on the part of the host against the effects of infection or of irritation without infection. It is important, then, to learn whether the clasmatocyte may be a participant in the inflammatory sequence, as its function, in part at least, is protective. Apparently, it does enter thus into certain disease syndromes. Salimbeni's[5] observations on the streptococcus may again be cited here; also, the recent work of Gay and Morrison.[10] A careful reading of the discussion by Mallory[12] with regard to the lesion produced by *B. typhosus* leads one to the belief that these macrophages

5. Salimbeni, A. T.: Le destruction des microbes dans le tissue souscutané des animaux hypervaccines, Ann. de l'Inst. Pasteur, 12: 192-209, 1898.

6. Buxton, B. H., and Torrey, J. C.: Studies in Absorption, J. Med. Res., 15: 5-88, 1906.

7. Goldman, E. E.: Die innere und äussere Secretion des gesunden und kranken Organismus im Lichte der vitalen Färbung, Verhandl. d. deutsch. pathol. Gesellsch., 14: 138-143, 1910.

8. Evans, H. M., and Scott, K. J.: On the Differential Reaction to Vital Dyes Exhibited by the Two Great Groups of Connective-Tissue Cells, Carnegie Institution of Washington Contributions to Embryology, 10: 3-55, 1921.

9. Murphy, J. B., and Ellis, A. W. M.: Experiments on the Rôle of Lymphoid Tissue in the Resistance to Experimental Tuberculosis in Mice, J. Exper. Med., 20: 397-403, 1914.

10. Gay, F. P., and Morrison, L. F.: Clasmatocytes and Resistance to Streptococcus Infection, J. Infect. Dis., 33: 338-367, (Oct.) 1923.

11. Simon, F. B.: Ueber die Einwirkung laukocytenhaltiger Flussigkeiten auf Streptokokken, Centrabl. f. Bakt., I, Orig., 29: 113-122, 1901.

12. Mallory, F. B.: A Histological Study of Typhoid Fever, J. Exper. Med., 3: 611-639, 1898.

are numerous in that reaction. Foot[13] indicates a similar defensive function against tuberculosis. According to Letulle,[14] they are particularly in evidence in the lesion of kala azar and of oriental sore. He describes these diseases as "characterized by many macrophages." One of us (T.D.B), with Simonton and Williams,[15] describes reactions in the gum in pyorrhea that lead one to expect the presence of clasmatocytes.

The studies herein described were undertaken in an effort to learn whether clasmatocytes are to be found in or on gingival tissue in pyorrhea. In pyorrhea, there is a subacute inflammation of the gum.[15] The alveolar process is attacked, the periodontal membrane is disrupted and, if progress is uninterrupted, the tooth is exfoliated and drops out.

There are doubtless factors as yet undescribed that enter into the relative resistance of human individuals to the disease. Young persons ordinarily are not affected, and yet age is no real criterion, for some persons not yet 20 years of age give evidences of its beginnings. This disease is exceedingly common in older persons; yet one finds those of 70 who do not show its effects. In some, it progresses slowly and without interruption; others manifest a sequence characterized by many halts in its advance and even by temporary repair of tissue. In some, the inflammatory reaction is intense; in others, it is absent on casual examination, although histologic section will reveal it. Finally, most of the lower animals do not present any lesions of the disease even though, histologically, there may be relatively little difference between their investing tissues and those of human beings. Logically, then, one should expect that there is some complex of factors, possibly related to immunity either local or general, which in certain persons hinders the progress of pyorrhea, and in others is less effective. We have drawn attention to the clasmatocytes as an agent for resistance.

In our desire to learn whether clasmatocytes are present in the pyorrheal lesion, the following points are of value. Purulent exudate ordinarily is produced, and this finds its outlet into the subgingival sulcus. Presumably, then, clasmatocytes, if present, are not only within the inflamed tissue but also in the exudate outside. Therefore, search by vital staining procedures with the microscope should reveal them.

A survey was made of a number of human mouths in order to obtain a variety of material for observation. Patients for such examination were obtained at the dental clinic at San Quentin Penitentiary, San Quentin, California, through the courtesy of Warden James A. Johnston and Dr. L. L. Stanley, prison physician. Those selected comprised men showing varying stages of advancement of pyorrhea, as well as many who gave no evidence of this condition on clinical examination. The patients were of varying ages, the average being 32.1 years. Many races were represented, but the larger portion were American whites, negroes and Mexicans. This survey was carried through for us by Drs. Willard C. Fleming and L. B. Shone, and they in turn used a chart (Table 1) for recording their results,

13. Foot, N. C.: Studies in Endothelial Reactions. III. The Endothelium in Experimental Pulmonary Tuberculosis, J. Exper. Med., 32: 533-546, (Nov.) 1920.

14. Letulle: Traité d'Anatomie pathologique, Vol. 1: p. 109.

15. Beckwith, T. D.; Simonton, F. V., and Williams, Adrienne: A Histologic Study of the Gum in Pyorrhea, J.A.D.A., 12: 129 (Feb.) 1925.

TABLE 1.—RECORDING CHART

Name ..... Number .....

Condition of mouth as to

Pyorrhea ..... Caries .....

Recession ..... Clinically normal .....

Age ..... Uses toothbrush .....

Treated or untreated

Dental Condition

	NONE	SLIGHT	MODERATE	MARKED
Recession				
Detachment				
Pocket				
Pus				
Loose teeth				
Hypertrophy				
Serumal calculus				
Salivary calculus				
Detritus				
Caries				
Fillings				
Extracted teeth				
Inflammation — Marked gums purple				
Inflammation — Marked gums red				
Inflammation — Slight				
Inflammation — Inflamed gingival margin				
Gums — Anemic				
Gums — Normal				

which had been elaborated previously by Dr. C. Westbay.

This general survey was in turn supplemented at the time of microscopic examination by dictation of notes respecting the clinical condition of each tooth. Finally, each tooth was considered and entered as a separate unit, in conjunction with general observations regarding the mouth at that moment under consideration.

Material from the gingival crevice of alternate teeth was examined. Lack of time necessary to make preparations from each tooth surface and at the same time to include a sufficient number of mouths to be representative was the limiting factor here. We believe, however, that our methods insured representative information. No crowned teeth were included.

The total numbers of examinations of material from gingival crevices adjacent to the various teeth are shown in Table 2. The mouths of seventy-three men were studied.

TABLE 2.—THE POSITION OF GINGIVAL MATERIAL EXAMINED

Location of tooth	*Number*
Upper left third molar	33
Upper left first molar	73
Upper left first bicuspid	65
Upper left lateral incisor	61
Upper right central incisor	65
Upper right cuspid	68
Upper right second bicuspid	60
Upper right second molar	55
Lower left third molar	49
Lower left first molar	47
Lower left first bicuspid	68
Lower left lateral incisor	68
Lower right central incisor	71
Lower right cuspid	72
Lower right second bicuspid	62
Lower right second molar	58
Total	975

The technical methods adopted follow. A site beside each tooth was chosen as far within the sulcus as possible. If a pyorrheal pocket was evident, material was removed from its depth. Care was taken not to produce hemorrhage by trauma lest the clasmatocytes be obscured by excess of extraneous material. As far as possible, the materies alba (the white colloidal material composed of bacteria, disintegrating cells and the remains of food) was removed in order that access might be obtained to the surface of the gum tissue itself within the crevice. The exploration and the removal of the sample for examination was carried out by the use of a delicate bladed dental instrument. Immediately after its collection, the small amount of exudate was suspended in a 1:400 solution of neutral red in equal parts of sterile physiologic sodium chlorid solution and rabbit serum, according to the method outlined by Gay and Morrison.[10] Examination then proceeded by use of the high dry objective. In order that the personal factor might enter into our results as little as possible, all observations were made by one of us, while all preparations were set up by the other. A clerk entered the data as dictated. For each preparation, a note was included regarding clasmatocytes, polymorphonuclear leukocytes, squamous epithelium, erythrocytes, rod and spiral forms and unorganized débris, together with a general description of the clinical condition of the tooth and external investing tissues. The tooth position was tabulated. We used plus signs to indicate, roughly, the amount or intensity of each factor included in this survey, varying from one to three according to the degree. As a result of this procedure, we were enabled to work out data regarding the occurrence of clasmatocytes in association with clinically evident inflammation, pockets, detachment, recession, calculus and caries. It should be stated that our figures regarding

caries are not complete as no careful examination was made. Only those cavities that were at once evident to the eye could be included here.

The results of this survey are shown in Table 3. The figures indicate the positive only and not the degree. In other words, no attention was given to the numbers of plus signs in any individual conditions, one, two or three being counted merely as positive.

TABLE 3.—RESULTS OF SURVEY AT SAN QUENTIN PRISON

Condition	Number of Teeth Affected
Inflammation	545
Detachment	268
Recession with detachment	440
Normal as regards detachment and recession	267
Pockets	126
Annular calculus	310
Clasmatocytes	490
Caries	34

It will be noted that clasmatocytes were found in 51 per cent of the teeth examined, as a result of the one smear prepared from each. Further analysis of this survey showed that in these 975 teeth, there were evidences of some condition of pyorrhea in about 544, or 56 per cent, of the total. We believe that this comparatively low incidence of the syndrome of pyorrhea, 56 per cent, is probably due to the relatively low average age (32.1 years) of the seventy-three men examined.

It is of interest to determine the relationship of the clasmatocyte to the inflammation that occurs in nearly all cases of the disease. Of the 975 teeth examined, 552 showed clasmatocytes or inflammation or both. They are divided into groups (Table 4).

Thus, with the two factors of occurrence of clasmatocytes and inflammation, both together and separately as in these 552 teeth, we find that the macrophage is present with inflammation as its concomitant in 483, or 87 per cent. Furthermore, clasmatocytes were present in 483 instances, or 88 per cent, of 545 teeth whose gums showed inflammation.

TABLE 4.—RELATIONSHIP OF INFLAMMATION TO CLASMATOCYTES

Both clasmatocytes and inflammation	483
Clasmatocytes only	7
Inflammation only	62
Total	552

Again, of 490 teeth about which clasmatocytes were proved to be present, 483 showed evident inflammation. This is 98 per cent. Thus, we come to the conclusion that the clasmatocyte accompanies the inflammatory reaction in pyorrhea.

The formation of pockets signalizes a period when there is active degeneration of the periodontal fibers. Inflammation is nearly always present with pockets. The inflammatory sequence, however, has not proved itself effective in ridding the tissue of the agents causing destruction. It is of interest to determine whether the clasmatocyte may be found within the exudate from pockets and how often. Of our series of 975 teeth, pockets were present in the investing tissue in 126. An examination of the figures regarding these 126 teeth is given in Table 5.

TABLE 5.—RELATIONSHIP OF POCKETS TO CLASMATOCYTES

Both pockets and clasmatocytes	108
Pockets without clasmatocytes	18
Total	126

Clasmatocytes, therefore, were present in 108 of 126 pockets, or 86 per cent, as proved by one smear for each pocket. It will be recalled that we have determined

these cells to be demonstrable in 88 per cent of the cases giving evidence of inflammation. It is of additional interest, therefore, to note that the clasmatocyte may be determined readily in that stage of the disease which is attended by pocket formation, and at a time when the area nearly always is inflamed.

Our tabulations also allow us to come to conclusions as to whether calculus stimulates the appearance of the clasmatocytes directly, or whether, if present, they are there merely on account of the inflammation, which, presumably, the presence of calculus itself may induce. In other words, does calculus stimulate the appearance of clasmatocytes directly or indirectly, if at all?

But first, let us consider whether calculus really does produce the inflammatory reaction. Because of its intimate contact with the gingival epithelium as a foreign body, one feels justified in stating that it does. Certain authors have gone so far as to state that calculus may even constitute the etiologic factor of pyorrhea, but this, we believe, is not proved. Our original tabulation shows 310 teeth with subgingival (annular) calcular deposits. They are divided as follows in Table 6.

TABLE 6.—RELATIONSHIP OF CALCULUS TO INFLAMMATION

Both calculus and inflammation	270
Calculus without inflammation	40
Total	310

Of these 310 teeth, then, which show varying degrees of annular calculus, 270, or 87 per cent, gave indications of inflammation within the closely adjacent tissues. Thus, it is shown that subgingival calculus is attended ordinarily by inflammation.

The second step in an attempt to determine whether calculus functions as an agent to induce clasmatocytes to appear about these same 310 teeth impels us to work out the incidence of clasmatocytes in gums lying in contact with this material. The following figures, in Table 7, give this.

TABLE 7.—RELATIONSHIP OF ANNULAR CALCULUS TO CLASMATOCYTES

Annular calculus and clasmatocytes	232
Calculus without clasmatocytes	78
Total	310

The first thought of the reader will be that since clasmatocytes are found in about 75 per cent of teeth that are laden with subgingival calculus, there must exist some direct relationship between the presence of the deposit and clasmatocytes; or, in other words, there must be a positive chemotaxis on the part of the macrophage toward the lime compounds. It has already been indicated in Table 6 that 270 out of 310 incrusted teeth show inflammation. Previously, we have shown that the incidence of clasmatocytes on inflamed gingival surfaces is 88 per cent (Table 4). If, then, we combine these last two statements, our expectancy of finding clasmatocytes on the gums about the 270 teeth that show inflammation should be indicated by 88 per cent of 270, or 238. The difference between this figure and 232, which is the number actually observed in the occurrence of clasmatocytes with calculus, is immaterial, and thus we are forced to the conclusion that clasmatocytes occur about teeth with subgingival calculus merely as a result of the inflammation induced by the calculus. The effect of the deposit on the macrophages, therefore, is indirect.

The second of these auxiliary points relates to the likelihood of the occurrence of both pyorrhea and caries about or in the same tooth. Much discussion

has centered about this point. Some believe that a pyorrhetic tooth never is infected with caries, while still others are of the opinion that these two conditions are utterly independent of each other. Our results are presented in Table 8. It should be restated here that we have accepted as the characteristic syndrome of pyorrhea an inflamed gum together with detachment, or recession or pocket formation. Moreover, only evident caries has been included.

TABLE 8.—THE POSSIBLE COINCIDENCE OF PYORRHEA AND CARIES

	Number	Percentage
Both pyorrhea and caries	27	4.9
Pyorrhea without caries	517	93.8
Caries without pyorrhea	7	1.3
Totals	551	100.0

It is evident from the foregoing that pyorrhea seems to inhibit caries, as a freedom of 93.8 per cent of pyorrhetic teeth from evident caries is remarkable. On the other hand, both diseases do affect the same tooth in certain cases. It is probable that some carious teeth may become pyorrhetic from injury resulting from the failure of the altered form of the affected tooth to protect the investing tissue.

CONCLUSIONS

1. A survey of 975 teeth in seventy-three men selected at random, with average age of 32.1 years, showed 544, or 56 per cent, with evidences of pyorrhea in the surrounding tissues.

2. The clasmatocyte of Ranvier was present in the adjacent gingival margin of these 975 teeth in 490 instances, or 51 per cent. We consider this the usual incidence.

3. The clasmatocyte occurs on the inflamed surface next to the tooth in 88 per cent of the cases. On the other hand, we rarely found these cells without evident inflammation. Thus the clasmatocyte accompanies definitely the inflammatory sequence in pyorrhea. This relative incidence persists even to the point of pocket formation.

4. The presence of subgingival (annular) calculus was attended by inflammation in 87 per cent of our cases. It is the inflammation rather than the calculus that stimulates the appearance of clasmatocytes here. As a corollary, there is no positive chemotaxis exerted by the calcium compounds of calculus on the macrophages.

5. There is a tendency for pyorrhea and caries to occur dissociated from each other. This tendency is not well defined. They may occur together.

There remain two questions of paramount importance for further study: first, as to whether a greater abundance of clasmatocytes is present in cases with immune tendency; and, second, as to whether the appearance of clasmatocytes can be stimulated.

METHODS BY WHICH THE SERVICES OF THE PERIODONTIST MAY REACH A LARGER NUMBER OF PEOPLE

By HAROLD J. LEONARD, B.A., D.D.S., Minneapolis, Minnesota

(Read before the American Academy of Periodontology, Cleveland, Ohio, Sept. 7-8, 1923)

THERE are two reasons why a study of the adequacy of present dental methods and organization in relation to the needs of the public should be initiated particularly by this body. The first is that the public gets the least service in periodontia, contrasted with the great need for it, of all branches of dentistry. The other is that the Academy consists of a group of dentists more scientific and more socially minded, or, if you please, more objective in their outlook than the average, and therefore one that should take the lead in an effort to make dentistry and dental service adequate and available to all those in need of it.

In order to arrive at methods of attaining fulfilment of the function of dentists and dentistry, it is necessary to analyze as far as possible the factors now operating. Since this paper is addressed primarily to periodontists, and has to do especially with increasing the adequacy of periodontia service, the factors that contribute to competency in this branch will be dealt with particularly. Many of these factors do not apply to other branches of dentistry.

The first factor in our problem is the prevalence of dental perioclasia. It has been stated that everyone over 40 who is untreated has more or less of the disease; also that as many teeth are lost from it as from dental caries. The observations of dentists will vary within wide limits, depending on the age of patients dealt with, the class of patients, the region, etc. An examination of several hundred school children in country and village schools in Minnesota showed that a considerable proportion had well marked gingivitis. Some as young as 10 years presented marked recessions and perioclasia about the lower anteriors. Most of these cases in children could have been well handled by a careful dentist or dental hygienist, as, of course, pocket formation was slight and subgingival calculus was not present in large amounts or difficult of access. A study of 1,468 University of Minnesota students entering as freshmen showed that 284 had definite gingivitis requiring really more than the ordinary prophylactic care; seventy-three had moderate dental periodontoclasia, and nineteen advanced or severe pocket formation, subgingival calculus and, in some cases, mobility from traumatic occlusion and loss of attachment.

In the summer session, when the enrolment is made up largely of school teachers and graduate students of older years, the proportion of advanced cases is greatly increased, although no figures are available on this at present.

In studies made of hospital patients in the University of Minnesota Hospital most of the chronic patients of older years were found to have well marked periodontoclasia. Many of these have been so greatly improved by treatment of this condition alone, as regards such systemic symptoms as loss of weight, loss of vitality, anemia, nervousness, insomnia and rheumatic conditions, that it has come to be regarded here as proved by clinical evidence that periodontoclasia is one of the great causes of chronic invalidism and systemic disease.[1]

The second factor in our problem is the inability of the dentist in average practice to cope with this disease when it occurs in his patients. The proportion of dentists who try to do something for their patients is probably large, although it is not at all uncommon to have patients with a well marked but easily treated gingivitis advised to have all the teeth out. Or an advanced condition may be passed over with no comment to the patient or at most the statement that the gums are inflamed, and no attempt be made to treat the condition. These incidents are very common in periodontia practice in Minneapolis and I am sure that conditions are not very different elsewhere. They indicate that a large number of practitioners maintain a hopeless or indifferent attitude toward the disease and that patients are not being served in this branch of dentistry.

But when the average dentist does attempt treatment, the results are not much better. His best work, of course, is in those cases in which pockets are not deep; serumal calculus is easy of access, and traumatic occlusion and low tissue vitality are not major factors. There are several reasons why the average practitioner is unprepared for this work. In the first place, his major interest is in reconstructive dental work. That is the thing he likes. He often dislikes periodontia work intensely and so avoids it. Even if he were trained, he could not give a sufficient proportion of his time to periodontia technic to keep himself expert. In the second place, the opportunities for adequate training have, in the past, been practically nil. It is only recently that periodontia has become a recognized division of dental science and technic in the dental colleges. Even yet, there is no standardization of such science and technic. It is only in a few schools that adequate instruction can be said to be given. It is only within a year that a textbook of a scientific nature on the subject has become available. It is only within the last five years that two of the greatest factors in the etiology of the disease, namely, traumatic occlusion and low tissue resistance or vitality, have become generally recognized. It is no wonder, then, that the average practitioner, trained in college some years ago, finds it difficult to understand the disease or to get results. To add to his confusion, we have dozens of proprietary preparations each guaranteeing effective results, and dozens of self-styled specialists and experts each with the only real method of treatment that

1. Leonard, H. J.: Dentist's Part in Medical Work, Dominion Dent. J., 28: 316-326, 1916.

can be learned by a week's course at $200 and a set of instruments or apparatus costing from $100 to $500. The confusing thing about these methods is that the treatments are often based upon supposed causes so far apart as to be really laughable.

These courses are so tinged with commercialism, so complicated, in order to sell more instruments and to enhance the supposed expertness and attainment of the teacher, and so buttressed with bombast that they have brought the whole field of periodontia into disrepute with many thoughtful dentists. The harm wrought by these remedies and methods lies in the fact that they are so confusing to the average practitioner. He is utterly discouraged at the outset and simply neglects this side of his practice. He is led away from the comparatively simple principles actually involved and simple technic actually required for most cases and does not do what he might.

A third factor preventing people from having their dental periclasia treated is the high expense of treatment. With dentistry organized as it is at present, with each man in an individual office with all its overhead, a high expense is unavoidable. Treatment even in its simplest form requires several hours. It is a very difficult and exacting technic to the operator, and six hours is about all the man of average vitality can stand each day and maintain his health. In addition, it requires years of experience and study before the operator gets sufficiently expert in diagnosis and technic to give the best service. The instruments necessary to make up a diagnosis and treatment are expensive. If the operator is to keep abreast of the times, he must keep trying out and discarding equipment, which is expensive. To operate to advantage, he must maintain a beautifully appointed office in an expensive part of town and maintain an office force of at least one assistant. All of this brings the cost of doing business per hour to so high a level as to put it out of reach of the majority of people.

As an additional factor in this expense, many periodontists take much more time than is necessary for health purposes in their treatment. Some methods demand a high luster polish of every crown surface, requiring for this part alone fifteen to twenty hours. While there can be no objection to this method, with its evident cosmetic advantages, for those who can afford such a luxury, many periodontists have proved to their complete satisfaction that it is unnecessary as a method of regaining a healthy periodontium. It materially limits the number of patients that an operator can attend, and if he insists on it for all his patients, it limits the number of those he serves to persons of more than average means.

The fourth great factor preventing people from getting adequate periodontia service is their lack of correct information on the subject. In the first place, they are not acquainted with the symptoms and progress of the disease and do not realize their need for service. Many of them commence to lose teeth or are ill from systemic disease caused by disease about the teeth before they are aware that the condition is present. Treatment of this disease, like that of others of insidious and painless onset, is put off until too late to give the greatest value. The sources of information for the public are extremely inadequate. As stated before, most

dentists are so ill-informed themselves or are so indifferent that patients are not fully acquainted with the condition and what might be done for it even when they are able to pay and are earnest in their desire for efficient service. They get most of their information from advertisements for dentifrices and toothbrushes. Although such education does much good in acquainting people with symptoms and even to some extent with methods of beneficial home care, it also does harm, as all "patent" medicine advertising does, in creating a false confidence and faith in some preparation and thereby postponing the day when proper necessary service can be given. As scientific information is disseminated among dentists and thence given to the public, these quack preparations will disappear from dentistry just as they have from medicine with the onset of scientific medicine.

People also need education in the cost of periodontia service. Many patients able to pay and needing service refuse to get it because of supposedly exorbitant fees. Dentistry, in raising itself from a mechanical art to a scientific profession, is suffering from "growing pains," and this is one of them. People are taught by dentists themselves to regard highly, and to pay adequately for, reconstructive work, while time spent on examinations, diagnosis, pulp treatments, prophylaxis and periodontia is more or less thrown in. Psychologically, the reconstructive pieces appeal to the senses and imagination as having more permanent value than treatment work. Dentists have merely catered to this tendency, and those who devote themselves to treatment work, and the treatment work itself, suffer for it. There is nothing spectacular about periodontia. To the patient in the chair, it is merely a more thorough, painful and long drawn out examination and "cleaning" than usual. When he is informed that the fees are greatly in excess of those usually paid for examination and cleaning he is much astonished and outraged. In other words, he must be reeducated in dental values. The periodontist must defend himself and his work and prove to his patient his own expertness and his reason for demanding fees that to the patient seem exorbitant as compared to treatment service he has received before. A patient who could easily be induced to have a piece of bridgework inserted will not take kindly at all to paying a similar fee for treatment work which may require much more time. This sort of educational work is so disagreeable to many able but modest men who might otherwise be interested in periodontia that they refuse to take it up as a life work. This is one of the important reasons why periodontia service is not more adequate to the need for it.

These four main factors then make up our problem: the great prevalence of dental periclasia with its attendant systemic complications and socially economic losses; the inadequate ability of the average dentist to cope with the disease; the expense of treatment prohibitive to the mass of people as dentistry is organized at present, and, lastly, the lack of proper education of the public in the need of treatment and the costs. With these in mind as a foundation, let us proceed to possible methods of handling the problem.

The first method is, of course, that of prevention. Taken in its early stages many times more cases can be handled by a single operator than later on, the

technic is not complicated and the cost of treatment is comparatively slight and within reach of all. Plainly, this is the easiest avenue of approach for those in whom the disease is in its incipient stages. Periodontists, at least through the Academy, should give all possible impetus to oral hygiene efforts. Anything that can be done to standardize such efforts should be done. The work that the Academy is undertaking through its educational committee, of which Dr. Hayden is chairman, cannot be too highly commended. This work of collecting all available material published anywhere for lay public education in dentistry and compiling it into authentic bulletins that will be made available to every agency dealing with hygiene and health matters surely will do much to standardize and simplify oral hygiene work and thereby give it additional impetus. The work of school oral hygiene is not adequate until every child from the age of birth and before, up to and through the university is watched and taught and treated in dental matters until a healthy mouth is assured. The educational work and even the actual treatment work is well along in many cities and towns, but taken throughout the country, it is in its very beginning. Much more can be done through the popular press than is now done. Instead of beauty hints and pyorrhea cure advertisements giving education, there is every opportunity for well worked out scientific, yet popular, articles or stories published by organized dental societies. The Minneapolis District Dental Society is now cooperating with the editor of the city papers in a series of stories to be run this fall that are excellent. The papers are cooperating in every possible way and require only that the material be put up in a form attractive to their public. Similar cooperation is being shown by the directors of some of the radio station. The Minneapolis Society has broadcast by radio a series of articles that also are excellent. A school dental hygienist read the articles in order to take away any taint of personal gain.

The most effective means of promoting this school oral hygiene work is the adequate training and employment of dental hygienists (called "dental nurses" in Minnesota). For, after all, the effects of public lectures on oral hygiene addressed to parents' associations or presented over the radio or in the press are evanescent unless followed up by daily personal work. The work of training and employing dental hygienists should go on until every child from birth to maturity can be examined and given prophylactic care at least twice a year. When this stage is reached, we may be said to have brought periodontia service to adequacy for a part of our population at least, and most of the battle will be won. I say periodontia service here because, in my judgment, prophylactic care and teaching of home care are much more effective as preventives of gingivitis and dental periclasia than of other dental abnormalities such as caries and malocclusion. To be sure, the examination of the child will probably lead to repair of caries; the prophylactic treatment and home care are somewhat preventive, and individual training of parents, teachers, and children in matters of diet, mastication and other hygienic requirements are helpful. But until we have further scientific data upon which to base preventive measures, dental caries will continue to

present a problem in repair work, which fortunately we do not need to consider here.

If the Academy is to assume, as it should, the rôle of a directing, organizing, and standardizing head in things that pertain to the treatment and prevention of dental periclasia, it should certainly do all it can to standardize the laws and curriculums for dental hygienists. I hope that a questionnaire sent out recently by Dr. Gearhart to the members of the Academy is a step in this direction.

In the fight on dental periclasia for the people now suffering with it, and who will be suffering with it in spite of preventive measures, the first weapon is education. And the first persons to educate are the dental students. The Academy should, if possible, work out a standardized and simplified theory and technic that can be used effectively in teaching this subject in schools of dentistry. If the members of the Academy could agree on such a course, it should not be difficult to get it adopted in the schools, since many of the teachers of this subject are members of the Academy. To agree on such a technic will, of course, require a great deal of cooperation on the part of the members, since there is probably no subject in dentistry on which there are such diverse opinions or on which those holding these opinions are more convinced of their infallibility. It seems to me high time, however, that the members of organized periodontia should, like those of organized prosthodontia, take hold of their problems in a modest, scientific spirit, study them out and arrive at conclusions.

Not only should there be taught to the student a technic that is simple enough to be well learned and used in average practice after graduation on the cases that do not present too many difficulties, but sufficient study of causes, symptoms and types should go with it as well, so that the student knows what he is doing when he starts a case. If the dentist does not see the major causes operating in his case, no matter how many hours he spends treating minor ones the result is a failure. With the knowledge now available, there is no excuse for present graduates of dental colleges failing to recognize the disease when it is present; or for being unable to tell whether the case presents a favorable or unfavorable prognosis, or to tell what are the major etiologic factors needing correction. While expert root surface technic or apoxesis is absolutely essential to the best results in treatment, and undoubtedly consumes the major portion of the periodontist's time, the most important factor in his success is his diagnosis,[2] his ability to understand the causes of the disease in each case and the methods necessary to treat and to prevent them from operating further. No matter how perfect a technic of apoxesis is taught in school, the graduate will continue to have baffling and discouraging failures unless this diagnostic work goes with it.

Much might be done in school to stimulate an interest in this branch of dentistry. There is a need of many periodontists, not perhaps in private practice, but in group clinics, of which more will be said later.

The next group needing education are the dentists now in practice. Their only means of educating themselves

2. Stillman, P. R., and McCall, J. O.: Clinical Periodontia, New York: The Macmillan Company, Chap. 8-13, 16.

until recently have been the dental journals with their variety of unscientific articles on periodontia; the dental clinics at the dental conventions, or the week or two weeks' courses mentioned above. None of these is adequate. In order to arrive at a satisfactory stage in this work, it has been necessary for the worker to get all he could from these methods and then work alone in the dark with many failures until, by sheer repetition and experience, the light began to appear and the subject resolved itself. The fact that every periodontist today is self made in this way is the reason why each is so sure his way is the correct and only one. Again, we must overcome this attitude in ourselves; confer, and arrive at common principles of theory and technic that we can teach to the dental public. It would be a fine thing to have extension courses in periodontia that were endorsed or organized by the Academy given at strategically located dental colleges. The course that Dr. House has given in dental prosthesis at the University of Minnesota each summer for the last five years has done wonders in bringing this branch of dentistry to a high degree of scientific and technical perfection throughout the country. Perhaps Drs. Stillman's and McCall's course at Columbia is such a one. If so, it is not getting the advertising it deserves.

Dentists need educating not only in the theory and technic of periodontia but also in the economic aspects of its practice. If dentists are to bring the treatment or scientific aspects of dentistry abreast of the reparative or art aspects, they must educate their patients to an appreciation of their values. Patients should pay for time spent on such work at the same or a higher rate than for purely mechanical procedures. Nothing will do more than this to raise dentistry from a mechanical art to a scientific profession in the minds of both the dental and the lay public. This fact should be emphasized in every discussion and clinic given by our members.

A third group needing education in periodontia are the dental hygienists. In Minnesota, the law states, in effect, that they may not go beneath the gingiva to remove calculus. This to me is an absurd prohibition since the subgingival calculus is much the more vicious in its effects, and in most cases, especially in children and young persons, is readily found and removed, and if not removed by the dental hygienist is perhaps never removed.[3] Moreover, I do not regard the dental hygienist as an inferior technician in this branch of dentistry. I am sure that in every school they get more training in prophylaxis and calculus removal than do dental students. I see no reason why, if their course is sufficiently long and the requirements sufficiently high, they cannot be trained to be expert in apoxesis work. Since this is the phase of periodontia consuming the most time, it seems to me that there would be a great economic advantage in training workers to take care of this phase of the work. With a periodontist to make the diagnosis and supervise the methods of treatment and several dental hygienists capable of doing expert apoxesis certainly much more work could be turned out than is possible at present, and at a

3. Ganning, (Mrs.) T. Allen: Work of the Dental Hygienists Regarding the Prevention and Control of Pyorrhea Alveolaris, Dent. Cosmos, 59: 214-217, 1917.

reduced cost. The curriculum for the incoming class of dental nurses at the University of Minnesota calls for the same course in periodontia that the dental students get. This is a matter of a good deal of importance to periodontists. On all these matters we need much helpful exchange of opinion in order to work out a satisfactory common course.

The fourth group needing educating in regard to periodontology is the public. The sort of thing being done for oral hygiene by the Academy should be done for periodontia. Material for talks, lectures, newspaper stories, radio talks and magazine articles should be prepared and published under the auspices of the Academy. Such an effort will do much to minimize the harm now being done by commercial advertisers.

The fifth group needing education is ourselves. Note has already been made of the need of cooperative effort in order to simplify and standardize our theory and technic. But much needs to be done yet in a scientific way to increase our information on our subject. I wonder if the Academy could not finance some research worker who could take up some of our unsolved problems? This could be done through any of the universities. Some of the problems in periodontology that seem to me pressing are the following:

1. What are the sources of bacterial culture mediums in the mouth?[4]
2. What is the mechanism of calculus formation?[4]
3. What is the relationship between diet and dental periclasia?[4]
4. What are the systemic effects of dental periclasia as compared to dental apical or tonsillar abscesses?
5. What is the nature of the end result obtained by the various treatments on a periclasia pocket?
6. Does continued regular polishing harden the enamel?
7. What are the causes of traumatic occlusion and what are the best methods of treatment?[2]
8. What are the causes of undeveloped jaws and how may the condition be prevented?

While education is the first method of increasing our service there are other methods. Much can be done to increase the number of patients who can be treated in private practice. The first of these is a simplified theory and technic by which efficient results are obtained in the minimum of time. By this means, more patients can be treated in the same length of time. This also decreases the expense to each and increases the group of patients who can afford to be treated. It has been customary in many quarters in dentistry to make one's apparatus and technic appear as complicated and bewildering to the patient as possible in order to impress him and make him willing to part with a large fee. While the psychology of business perhaps demands a slight touch of this, modern, scientific medicine, including dentistry, is more and more discountenancing it. From the standpoint of one trying to find methods of increasing service, such business methods appear a big handi-

4. Black, G. V.: Special Pathology of the Pulps and Peridental Membrane, Medico-Dental Publishing Co., pp. 73-98.

cap and of an ethical grade bordering on charlatanism.

Dr. Bunting suggested, in writing to me about this paper, that he found he could treat more patients, in the long run, by short appointments. This would depend on the method or technic used. In my own practice, the shorter appointments would have no advantage since there are just so many moves to be made for complete diagnosis, apoxesis, grinding of occlusal surfaces and instruction in home care, and the shorter appointments simply mean more time spent between patients.

Another method by which more patients can be treated at lessened expense is by the employment of dental hygienists for the crown surface polishing, for frequent prophylaxis, and even for the bulk of the apoxesis work. As has been shown before, there is no reason why they should not become expert technicians in this work. Were it possible for the periodontist to organize his office in this way, with a group of dental hygienists working under him, there would be a great increase in the number of people he could serve and the cost to each could be materially reduced. This, in turn, makes possible the service to people not now able to pay for it.

As the third method of increasing the services of the periodontists to the mass of people now in need of treatment, the group clinic idea holds great possibilities. I appreciate that I am treading on ground that is being fought over. The idea of any organization of dental practice in which the individual in a measure loses his identity in a group is abhorrent to many. The bugaboo of socialized dentistry is raised, and it is made to appear that for the public to organize and run dental clinics at cost, in which a large public might be served, would remove the incentive and decrease the initiative and efficiency of the private practitioner. My experience does not bear out this view. We are all familiar with the institutional dental clinics in schools, hospitals, settlement houses, industrial and mercantile plants. My observation of these is that the men operating in them are much interested and are striving to perfect themselves in dental science and technic and in service to their patients. It is certain that efficient dental service can be given by this group method at a much lower cost to patients than is possible by dentists in private practice with all that is involved in the way of overhead expense. And eventually the method that is the most economical will prevail. By this, I do not mean that at some time there will be no private practitioners. I do not believe group dentistry will ever displace the services of private practitioners for those who can afford the cost. But in this paper we are concerned with those in need of service who are not now being served and cannot be served for economic reasons even were they educated to desire it. For these, I believe in group and community dentistry, and I believe that the Academy and its members should work for such organization instead of opposing it, as many leaders in the profession are doing. I would even go so far as to advocate that dentistry, at least those branches, such as periodontia, that lead to good oral, and good general health, be subsidized by the community or state so that everyone could have treatment available sufficient at least to gain or maintain health whether they are able to pay for it or not.

Society is already doing these things in medicine in its city, county and state hospitals,[5] and some of these institutions even include dental departments. The economic principle that it is good business for a community to treat its sick and make them well rather than have them continue a burden is well established. As professional men, we are primarily concerned with what is good for those we serve, and our own personal interests must be subordinated.[6] How, then, can we oppose that which is to the economic advantage of the public?

I have been associated this last year in such an institutionalized dental clinic in the student's health service of the University of Minnesota.[7] As far as I know, it is the only students' dental service in any college or university in the United States where students can have all branches of dental service at cost. The only thing the University furnishes free is the building space that the clinic occupies. Otherwise, the clinic is entirely self-supporting. By organization to eliminate any waste time or help, by purchase of supplies in large quantities, by elimination of non-essentials, it has been possible to turn out the highest grade of dental work and service at fees of approximately one-half what practitioners in private practice must charge for the same grade of work. The operators are mostly on a half time basis. They are chosen for excellence in knowledge and skill from among the men who have been in practice from two to ten years and whose time is not yet completely filled in private practice. They are all striving to perfect themselves in their work and service to their patients. The clinic gives them a chance to compare notes and gain from each other in such a way that they are all enthusiastic about what they are getting out of it in the way of increased knowledge, experience and skill. I know of no group of operators of whom it could be less truthfully said that they have lost their incentive, initiative or efficiency. The clinic is extremely popular with the students. Through it, they get excellent work, and obtain an education in good dentistry and its costs. They will go out of the university with a discriminating knowledge that is bound to have its effect on dentistry in the state. By means of the group organization, every student gets every type of dental service he needs. He is not subject to the liability of having dental periclasia, hidden abscesses or a broken dental arch passed over without comment, as happens so often with many private practitioners who perhaps do excellent work in the lines in which they are interested.

This personal experiment and experience in institutionalized group dentistry has convinced me that along this line lies a great increase in the service that can be rendered in dentistry by periodontists in particular. The scientific training of the periodontist fits him unusually well for directing this type of work. Furthermore, since many dentists actually do not do periodontia themselves and do not refer cases or even mention the need of such treat-

5. Sixteenth Annual Report of the President and Treasurer of the Carnegie Foundation for the Advancement of Teaching, 1921, pp. 67-69.

6. Holliday, Houghton: Better Dentistry for Less Money, Dent. Items Int., 39: 919-925, 1917.

7. Leonard, H. J.: Students' Health Service of the University of Minnesota, Minneapolis Dist. Dent. J., 6: 20-24, 1923.

ment to the patient, it is usually not done in private practice; while it is automatically taken care of in a properly organized clinic. In other words, the periodontist gets an opportunity to serve every patient needing him who passes through the clinic, while he has opportunity, in private practice, to serve only those whom a relatively few enlightened and unselfish dentists refer to him, or who come of their own accord because of information about their oral condition that they happened accidentally to get.

CONCLUSION AND SUMMARY

Periodontists are peculiarly the ones who should initiate and foster efforts to make dentistry adequate to the needs of the people. There is a tremendous prevalence of dental periclasia with attendant physical unfitness which is at present being cared for very inadequately indeed, even among those able to pay for the service. This is due to the indifference or inability of the average practitioner to meet the problems of periodontia from the standpoint of information, skill or business. This, in turn, is due to inadequate opportunities for training. High costs of treatment, in many cases unnecessarily high, because of elaborate methods, prevent most persons needing treatment from getting it. Also, they are not informed of their need of treatment or the reason for the expense in treatment.

The following are suggested as methods by which the services of the periodontist may reach a larger number of people:

1. An increase of preventive measures, such as school and popular education and school dental clinics, with an increase in the number and the efficiency of dental hygienists until all children are being cared for.
2. A standardized, simplified training in periodontia for dental students, dentists and dental hygienists in order that more efficient workers be prepared.
3. Education of the public in periodontology.
4. Further research upon which more adequate treatment methods may be based.
5. Simplified technic in private practice and the use of dental hygienists for much of the purely technical time-consuming work in order that each operator may serve more patients.
6. An increase in institutionalized, group dental clinics to the point where every individual may be treated who needs, it, at a cost which he can afford.

ANNUAL REPORT OF THE SECRETARY-TREASURER OF THE SCIENTIFIC FOUNDATION AND RESEARCH COMMISSION OF THE AMERICAN DENTAL ASSOCIATION FROM JULY 1, 1924 TO JUNE 30, 1925

By R. H. VOLLAND, M.D., D.D.S., F.A.C.D., Iowa City, Iowa

To the Scientific Foundation and Research Commission:

GENTLEMEN:

AT THE last annual meeting of the Commission, twelve grants were approved. The location and amount of each grant is as follows:

1.	University of California	$2,000.00
2.	Creighton University	300.00
3.	University of Louisville	1,500.00
4.	University of Michigan	1,800.00
5.	University of Minnesota	4,200.00
6.	Northwestern University	2,400.00
7.	Forsyth Dental Infirmary	4,000.00
8.	California Stomatological Research Group	1,500.00
9.	West Texas Dental Society	1,000.00
10.	Dental Index Bureau	1,742.00
11.	Nebraska State Hospital	500.00
12.	Bureau of Standards	600.00
		$21,542.00

A condensed statement of the work being done under each grant is as follows:

1. UNIVERSITY OF CALIFORNIA:

The personnel consists of:
Guy S. Millberry, Advisor
J. A. Marshall*, a Technician
A Laboratory Assistant*

The investigation is a continuation of the work outlined in the Secretary-Treasurer's report for the year 1923-1924, and covers:

(a) A study of the alterations in dental tissues resulting from malnutritional disorders.

(b) A study of the action of the "buffer" substances in saliva and their relation to dental caries and erosion.

(c) The therapeutic action of solutions of radium salts.

(a) The first problem deals with the effects upon experimental animals which may be produced by maintaining them upon inadequate diets. It is a continuation of a research previously reported and published in the Journal of the American Dental Association, January, 1924. In brief, inadequate diets are responsible for abnormalities in rats, in somewhat the same degree as they are in dogs. Those abnormalities include, for example, the rate of growth of the animal and histological and chemical changes in tooth structure and in bone.

The following quotation from Dr. Marshall's report explains itself. "Through the kindness of Dr. Herbert M. Evans, Professor of Anatomy, at the University of California Medical School, a number of animals have been placed at my disposal without cost to the American Dental Association. In addition, I have the facilities of the diet

*Workers marked with an (*) are the only ones receiving pay from the Commission.

kitchen, the chemical and histological laboratories. By following out this group plan of experimentation, in which everything of the rat is used except the squeak, we find that the facilities of the university in both personnel and equipment are utilized to the greatest advantage and with a minimum of expense to the American Dental Association. For example much of the routine work connected with the care of the animals is handled by the regular university staff. It is indeed fortunate that my research plan can be followed out in this manner, for if I were to ask for funds in maintaining the present equipment the sum would be somewhat staggering. One room contains over one thousand animals and constitutes one of the "stock colonies." You can well imagine that the detail work necessary to weigh, feed and clean the cages daily of three thousand animals is quite a little job in itself. One phase is rapidly nearing completion and I expect to take up the second part by January, 1926." Marshall.

(b) The second problem is concerned with the study of acid and alkaline salts in saliva and the relation to dental caries and erosion, work in this research hasn't developed as rapidly as desired because of lack of funds.

(c) The third topic is the therapeutic action of the solutions of radium salts. It is also a continuation of a research previously reported.

2. CREIGHTON UNIVERSITY:

Advisory Committee:
E. H. Bruening
C. E. Woodbury
J. S. Foote*

The investigation consists of the continuation of the work reported in 1923-1924. Progress has been made and much valuable material has been collected, prepared, studied and recorded. Dr. Foote's work is in the realm of pure science and is therefore fundamental. It will be valuable for all time and especially valuable to those who make a study of the hard tissues of the body.

NOTE: Since the above report was written it is learned that Dr. J. S. Foote died very suddenly on June 30, 1925. Dr. Foote was a distinguished scholar in the scientific world. He was an indefatigable worker with a true scientific attitude. His work will remain as a monument to his memory. It is greatly to be lamented that he was not permitted to finish the work he was engaged upon at the time of his death. Dr. Bruening will collect Dr. Foote's notes, manuscripts, illustrations and material and arrange them so that the information they contain will be accessible for reference.

3. UNIVERSITY OF LOUISVILLE:

The personnel consists of:
H. B. Tileston, advisor
Theodore B. Beust*
A. E. Lang

The investigation is a continuation of the work noted in the 1923-1924 report and covers:

(a) The determination of the course taken by the capillaries of the enamel between the amelo-dentinal junction and the enamel periphery. Special procedures of photomicrography have been evolved which demonstrate the normal relations of the dentine with enamel.

(b) Comparative dental histology.

(c) The effect of certain chemicals occurring in water causing mottled enamel.

(d) Metabolism of the enamel.

PUBLICATIONS AND DISCUSSIONS

Reports nearly ready for publication:
"The Effect of Certain Acids and Alkalies on the Enamel."
"The Relative Susceptivity of Various Enamel Surfaces to Acids."
"The Dentino-Enamel Boundary Line."

4. UNIVERSITY OF MICHIGAN:

The advisory committee consists of:
M. L. Ward
C. H. Lyons
U. G. Rickert
Mrs. Faith Palmerlee Hadley*

This investigation is a continuance of that reported in 1923-1924 and is explained by the following quotation:

"In this study we have observed *Streptococcus fecalis* as the predominant organism in the canals of pulpless teeth although it was never found in the case of live but degenerating pulps. In these examinations, which were made from the pulp chamber itself, *salivarius* took second place and *mitis* third place. These results are pointed out to be at variance with the results of those who have cultured periapical tissues, rather than the canal itself. The possible reasons for this discrepancy are discussed and lead to fundamentally new conclusions regarding the specific nature of root canal infections, and probably of periapical infection as well. These conclusions involve our conception of the specific instability of the streptococcus type in the viridans group and offer a new grounds for continued study of the etiology of root canal infections in themselves, and also in relation to other streptococcus foci in the body.

"In the study of elective localization in rabbits of cultures taken from infected root canals we have employed new methods of attack and have already observed a considerable number of specific localizations in rabbits of cultures taken from patients (teeth) experiencing various types of streptococcus infection and presenting arthritic, cardiac, gastric, nephritic or iritic symptoms.

"We have also, in connection with this study, established, as we believe, for the first time, the elective localizing power in rabbits, of an organism found rarely in root canals, but important in sinus infections sometimes involving the upper molars,—namely Friedlander's pneumobacillus (Bacterium pneumoniae). This we observed in two cases. In addition, we have succeeded in producing the microbic dissociation of these types and have isolated a strain of bacteriophage which effects the complete destruction of the living cultures in high dilutions." (Advisors)

PUBLICATIONS AND DISCUSSIONS

(1) The Rôle of Bacillus Acidophilus in Dental Caries: Bunting, R. W., and Hadley, Faith P.; J. D. A. D., April, 1925.

(2) Studies on the Etiology of Root Canal Infections: The Nature of the Causative Agents and Their Behavior with Respect to Elective Localization in Rabbits., Rickert, U. G., and Hadley, Faith P., (Ready for publication)

5. UNIVERSITY OF MINNESOTA:

The personnel consists of:

T. B. Hartzell, advisor
W. P. Larson*
E. T. Bell*
H. O. Halverson*
I. A. Epstein*
Marion Stevens*

The investigation is a continuation of the work carried on in 1923-1924 and covers:

(a) Effect of surface tension on bacterial toxins.

(b) Immunizing man to various bacterial poisons. This is an attempt to utilize the finding of (a).

(c) Sources of infection of nephritis.

(d) A blood study.

(e) Effect of diet and hygiene on the teeth and associated structures in the mouth of children in St. Paul's orphanage.

(f) Laboratory test for tuberculosis.

(g) Decalcification of teeth by substances other than acids. Dr. Larson, professor of bacteriology, University of Minnesota and his assistants have charge of the work under the headings (a), (b), (c) and (f).

Dr. Bell, professor of pathology, University of Minnesota, and his assistants have charge of the actual work under the headings (c). Dr. I. A. Epstein is doing the major part of the work under the heading (d).

Dr. Marion Stevens, specializing in children's dentistry, has charge of the work under the heading (e).

This unit reports encouraging progress. Especially encouraging results have been obtained under (a) and (b). While the work under these two headings up to the present time may be considered more intimately concerned with the field of general bacteriology, and we as a dental profession are interested, yet leads are appearing that make the work-

ers think that a more strictly dental application is soon to appear. There is a possibility of a practical streptococcal antitoxin being developed. The experimental work under (a) and (b) has progressed from a purely laboratory and annual experimentation to actual preventive and bedside work among humans. So far the serums that have received the major attention are for Tetanus, Diphtheria, Scarlet Fever, Pneumonia and Acute Streptococcal Infection.

The work under (c) has been carried on in an effort to produce experimentally chronic glomerulonephritis, the prevailing human type of chronic kidney lesions.

Many rabbits have been used in this work but without developing anything other than spontaneous nephritis. During the last year and a half about two dozen monkeys have been used. In one monkey a typical case of glomerulonephritis has appeared. This is the first instance on record of such a result being obtained.

Under the heading (d) work was begun in January. It is an effort to determine: the relation of a blood and the character of acidophilic granules in the white cells to a diagnosis of physical conditions of the patient. Twenty-five such examinations have been made and these blood examinations do not bear out the claims of Toren.

"However ground has been broken for the continuance of the broader study"—"to-wit a study of a series of normal variation in blood as to both red and white cells and hemoglobin, the study of a series of individuals suffering from mouth infections only, so far as their physical diagnosis can determine, and the study of a series of individuals who are suffering from other diseases and having more nearly healthy mouths." (Hartzell)

The work under (a) continues along the lines followed in 1923-1924. The work under (f) is a collateral field that appeared during the work on (a) and (b). A satisfactory and dependable test has been worked out and published.

The work under (g) is progressing but the work under the other headings in this group has occupied the time of the staff so completely that little has been done on the "decalcification of teeth" this year.

PUBLICATIONS AND DISCUSSIONS

(1) A Review of the year's work under the University of Minnesota grant to be presented before the Research Section at Louisville.

(2) Treatment of Pneumonia. (Serum plus castor oil soap solution) To be published.

(3) Induced Immunity to Scarlet Fever. Journal of Experimental Biology and Medicine—May, 1925.

(4) Immunization to Diphtheria. Journal of Experimental Bacteriology and Medicine, May, 1925.

(5) The Method of making pure Sodium Ricinoleate. Journal of Experimental Bacteriology and Medicine, May, 1925.

(6) Experimental Bright's Disease: Bell, Clausen & Hartzell. American Journal of Pathology, May, 1925.

6. NORTHWESTERN UNIVERSITY DENTAL SCHOOL *(Division A)*

The personnel consists of:

A. D. Black, advisor
E. H. Hatton*
Emil Mueller
Miss McMurrough
Anna C. Nichols
T. J. O'Dea, Graduate Student

The investigation covers:

(a) Investing tissues of the teeth particularly of the periapical region of pulpless teeth.

(b) Salivary and blood analysis.

(c) A histological and bacteriological study of the conditions in periapical infections without secondary systemic lesions.

(a) and (b) are continuations of work begun in a previous year. (c) is a new work begun in 1924. The work is progressing. Miss Nichols is a valuable addition to the corps as she is a very competent bacteriologist, a graduate of Purdue and M. S. (Chicago). She has taken charge of the routine work in bacteriology.

Enough animals have been inoculated with organisms recovered from Apical infections

of a chronic nature in individuals who seem otherwise in good health to indicate the value of this newer research. A report of this work will be made at the meeting of the American Dental Association.

The salivary and blood studies are being prosecuted but the results in this investigation are contradictory and, so far, inconclusive.

PUBLICATIONS AND DISCUSSIONS

(a) Discussion of J. P. Buckley's paper on "Bone Pathology" at the Dallas meeting of the A. D. A.
E. H. Hatton.

(b) Reaction of Saliva before Clinic of Chicago Dental Society, Jan. 22, 1925.
E. H. Hatton, Emil Mueller.

(c) Focal Infection
Kansas City Dental Society, Feb. 2, 1925.
E. H. Hatton.

(d) Differential Diagnosis of Mouth Lesions
Bloomington, Ill., Study Club, March 2, 1925.
E. H. Hatton.

(e) International Society of Dental Research, Pulp Abscesses at the Ends of Gutta Percha Fillings, March 20, 1925.
E. H. Hatton.

(f) Apical Regeneration After Treating and Filling the Pulps of Teeth.
Fox River Valley Dental Society, April 15, 1925.
E. H. Hatton.

(g) Focal Infection
Kansas State Dental Society, April 21, 1925.
E. H. Hatton.

(h) Apical Pathology after Treating and Filling Pulps, April 21, 1925.
Kansas State Dental Society, April 21, 1925.

(i) Focal Infection
Des Moines District Society, April 23, 1925.
E. H. Hatton.

(j) Apical Pathology after Treating and Filling Pulps
E. H. Hatton.
Des Moines District Dental Society, April 23, 1925.

(k) Table Clinic—Bone Pathology of Jaws
E. H. Hatton.

(l) Changes about the Apices of Teeth after Infection of the Pulps and after Treating and Filling.
Chicago Society of Internal Medicine, April 27, 1925.
E. H. Hatton.

(m) Focal Infection.
Illinois State Dental Society, May 12, 1925.
E. H. Hatton.

(n) Jaw-Bone Pathology—Table Clinic, Illinois State Dental Society, May 15, 1925.
E. H. Hatton.

This does not include papers on unrelated subjects, though by-products of this work read before the Chicago Odontological Society, the Chicago Society of Orthodontists and the American Medical Society (Atlantic City, May, 1925); nor the titles of papers published in Cosmos and the A. D. A., which have been previously reported.

All of the money received in this grant has been expended for technical assistance, (Misses Nichols and McMurrough and Dr. Miller.) In addition a considerable sum has been expended for animals, new equipment (already mentioned) and supplies.

6. NORTHWESTERN UNIVERSITY DENTAL SCHOOL *(Division B)*

The personnel consists of:

A. D. Black, advisor
William G. Skillen*
Emil Mueller
Wallie McMurrough, graduate student
T. J. Rushing
Edgar Blunt
H. K. Thompson

The investigation is a continuation of the problems outlined in the 1923-1924 and covers:

(a) Result of pulp canal treatment
(b) Pathology of Pyorrhea and Regeneration that occurs after different types of treatment.

The work of this division has been especially helpful to those working in Division A, and on this account has the hearty support of that group.

A very complete and efficient binocular microscope has been added to the equipment

of this section. The other expenditures have been made for the technician, stains and glassware.

PUBLICATIONS AND DISCUSSIONS

No papers, other than those listed last year, have been published, but three articles are now practically ready for publication including illustrations, one of which is to be presented before the Research Section at Louisville, on the pyorrheal aspects of these studies.

A second paper on "The Permeability of Enamel" is completed. A third on "The Results of Root Canal Treatment" is nearly ready. A fourth paper on "The Origin of Nasmyth's Membrane," and a fifth on "The Anatomical Relationship of the Gingiva and Nasmyth's Membrane" which may have a practical application to the pathology of pyorrhea, are under way.

NOTE: In submitting a report of the research work for 1924-1925 in Northwestern University Dental School the Dean attached a memorandum of the space in the new Montgomery Ward Memorial Building to be devoted to Research and Post Graduate Work.

The following condensed table is taken from the memorandum:

Medical Sciences	**Research**	**Sq. Ft.**	
Anatomy	13x13	169	
Histology	14x16	224	
Chemistry	12x19	228	
	14x16	224	
	8x 8	64	
Physiology and Pharmacology	16x29	464	
	10x14	140	
	6x16	96	
Pathology	16x20	320	
	12x16	192	
Bacteriology	16x20	320	
	10x16	160	
Totals, Medical Science Labs. Animal space in addition.			2101
Dental Technic and Clinical			
Applied Physics	9x16	144	
Metallurgy	15x23	345	
Prosthetic Technics	14x16	224	
Operative Technics	13x16	208	
Dentures	11x17	187	
Crown and Bridge	11x13	143	
Operative Dentistry	11x13	143	
	10x12	120	
Orthodontia	11x18	198	
Oral Surgery	13x23	299	
Totals, Dental Technic Labs. & Clinics			2131
Library Research Space	14x40		560
Totals			5152

In addition to this space set aside for research, 5173 sq. ft. of space will be devoted to post graduate study. Since quite a considerable of post graduate study is in the research field a large proportion of this space can be considered as being devoted to research also. This makes a grand total of 10,325 square feet and is equivalent to a single room 24 ft. wide by 431 ft. long.

7. FORSYTH DENTAL INFIRMARY AND HARVARD UNIVERSITY MEDICAL SCHOOL

The personnel consists of:

P. R. Howe, advisor
S. Burt Wolbach
Ruth E. Hatch*
Anna Tucker*
Otto Heinzer*
Winifred Murphy*
A. J. Miller
Canavan Theresa Taylor
Miriam Cougdon

The investigation is a continuance of the work done in 1923-1924 and covers:

1. Investigation of Caries.
   a. Caries production in experimental animals.
   b. Histological studies on carious process.
   c. Chemical studies on carious process.
   d. Methods of petrographic investigation applied to study of teeth.
2. Periodontoclasia—Production in experimental animals.
   a. Histological studies in changes which occur.
   b. Tartar Accompaniment and its significance.

   Is traumatic occlusion a first cause or a sequence?
3. Irregularity of the teeth.
   a. Growth of maxillary bones as a factor in irregularity.
   b. Too early extraction of temporary teeth in relation to irregularity.
4. Infection in relation to dental diseases.
   a. Kinds and types of bacteria.
   b. Attempts to establish the growth of various kinds of bacteria in the oral cavity.

5. Study of lesions which accompany abnormal feeding.
   a. Scorbutic lesions.
   b. Fat-soluble A deficiency.

Progress:

A. Caries is being produced with more frequency and greater regularity. The work shows
   1. teeth differ in structure;
   2. during the period of calcification teeth may readily be effected;
   3. after being fully formed they may undergo alteration.

B. Periodontal changes are produced by disturbing the metabolism of the animal. This applies to both the hard and soft tissues. The relation of these disturbances to irregularities of the teeth and traumatic occlusion is obvious.

C. These tooth and bone changes have been induced in a variety of ways. Especial effects have followed a deficiency of the antiscorbutic factor and of the fat-soluble A.

A full report of this work will appear within a few months. This report will not be a final but a preliminary one. Many changes in various organs also have occurred with regularity which will be described in this later report. Dr. Wolbach has already given brief accounts of these results before two scientific bodies so that they are recorded.

D. The infection in all these oral conditions is secondary. Oral conditions are symtomatic, not disease entities.

E. The dietary study previously reported is expanding. Intro-vitams are being studied also. This field of work is complex and needs much more study but the results obtained are very significant not only as regards the teeth but on account of the various tissue changes produced throughout the body. The results obtained so far, are regarded by various scientists who have examined the work, to be of fundamental importance.

F. A polarizing light investigation of dental changes is being made.

Equipment and facilities:

Our facilities have increased in every department especially at the Harvard Medical School, where the work appears to be highly regarded. At the Harvard Medical School, one animal room, one bio-chemical room, office and the use of the entire Pathological Department are devoted to this work. The other departments of the Medical school are cooperating.

At the Forsyth, the equipment is constantly being added to. Here a large animal room, a bio-chemical laboratory and a room for grinding and preparing foods are provided. Several new pieces of apparatus have been added, including improved constant temperature ovens and baths, ashing furnace, polarizing microscope, alpine lamp for ultra violet light, Hydrogen ion apparatus (Bovie) etc., etc. Forty large monkey cages and about 200 rat and guinea pig cages are being used. A new microtome and apparatus for tissue work as well as a full complement of bacteriological equipment which includes two large incubators, one smaller one and autoclaves have been added.

ANIMALS:

About 150 rats, 100 guinea pigs, 40 monkeys have been studied.

100 rats, 75 guinea pigs, 26 monkeys are now in the cases.

ASSISTANTS *and* STAFF:

Three assistants work at Forsyth, two at Harvard Medical School. Besides this Dr. Wolbach has several of his men aside from our technicians at work a large part of the time on various matters concerned with the work. Dr. Wolbach himself has devoted a large part of his time to studying the tissues of these animals and something like four thousand beautiful sections have been prepared to the present time. He and his staff have been and now are working gratis.

FINANCES:

Mr. Forsyth has contributed liberally—this has included money for apparatus, help, foods, chemicals. The Forsyth Infirmary has furnished much material and apparatus, as well as the services of technicians pay by the Infirmary. The funds of the A. D. A. have been devoted to paying in full two of the staff and in part two others. The Massa-

chusetts Dental Association has given $500.00 yearly which has been expended for cages, animals, etc., etc.

PUBLICATIONS AND DISCUSSIONS

(A partial list)

"The Foundation of Sound Teeth and Bones." Scranton, Pa.

"To What Extent are Present Theories of Dental Diseases Confirmed by Recent Research?"

Metropolitan District of Mass. Dental Society, (Howe & Wolbach).

"The Interpretation of Dental Lesions in the Light of Recent Research." Academy of Dental Science, New York.

"Dental Disease from the Standpoint of the Dietitian." Buffalo, N. Y., Alumni Meeting.

"The Relative Importance of the Diet as a Factor in Dental Disease." Michigan State Meeting, Grand Rapids.

"Pathological Changes in the Investing Tissues of the Teeth Experimentally Induced by the Diet." Pathodontia Sect. First District Society of N. Y.

"The Diet in its Relation to Dental Diseases." New York State Meeting.

"Experimental Effects of Deficient Diets." Pittsfield, Western Massachusetts Dental Society.

"The Diet and the Teeth." Wilkes-Barre, Pa.

"The Effect of Artificial Feeding in Infants on Developing Teeth." Altoona, Pa.

"Dental Diseases Experimentally Produced." Lewiston, Mo.

"The Effect of the Scorbutic State Upon the Production and Maintenance of Intercellular Substances."

S. Burt Wolbach and Percy R. Howe.

Proceedings Society Experimental Biology and Medicine.

"The Epithelial Tissues in Experimental Xerophthalmia."

S. Burt Wolbach and Percy R. Howe.

Pro. Soc. Experimental Biology and Medicine.

"The Effect of the Scorbutic State Upon the Production and Maintenance of Intercellular Substances."

S. Burt Wolbach and Percy R. Howe.

Society of Physicians and Surgeons.

"The Epithelial Tissues and Experimental Xerophthalmia."

S. Burt Wolbach and Percy R. Howe.

Society of Physicians and Surgeons.

Vide Editorial—Jour. Am. Med. Asso., June 13, 1925.

There have been requests from health workers, the agricultural and nutritional departments of the government and from various dental schools for slides and photographs which have been prepared in the course of this work, for teaching.

8. CALIFORNIA STOMATOLOGICAL GROUP

Advisor and Chairman, F. V. Simonton

The investigation is a continuance of the work outlined in the report for 1923-1924 and covers:

A CONTINUATION OF A RESEARCH ON PYORRHEA UNDER THE GROUP OR COOPERATIVE METHOD

It has been the effort of the Group, not only to conduct accurate studies of the various problems selected, but also to choose, as nearly as may be forecast, those problems which will bear most directly on the etiology of pyorrhea. Attention has also been given to clinical studies—statistical, descriptive and ethnologic.

SCOPE OF ACTIVITIES

Studies are being conducted in the following sciences:

(1) Bacteriology
(2) Experimental Pathology
(3) Histopathology
(4) Biochemistry—Nutrition
(5) Biochemistry—Organic
(6) Biochemistry—Inorganic
(7) Protozoology

RESEARCH OPPORTUNITY

San Quentin Prison: The cooperation and support of the former prison warden has been continued under the new incumbent, Warden Frank J. Smith. The president, Mr. George A. Van Smith, and the Board of Prison Directors, have been interested and sympathetic. Dr. L. L. Stanley, Resident Physician, has been unwavering in his cooperation—no effort has been too great and no inconvenience has been permitted to stand in the way of his support. Capt. K. P. Pietrzak, secretary to the Warden, and Mr. E. J. Hobbs, Captain of the Yard, have been friendly and helpful. Important technical

assistance has been rendered by certain of the inmates, while others have been willing and interested patients. Mr. Sid Kepford, photographer, deserves particular mention.

Departments of the University of California: The heads of the Departments of Bacteriology, Biochemistry, Zoology, Pathology, Dentistry, and the Hooper Research Foundation, have continued their cooperation with growing interest in and understanding of our problems. The facilities of their departments have been made available most generously. President Campbell of the University and Dr. C. B. Lipman, Dean of the Graduate Division and Secretary of the Reviewing Committee appointed by the Carnegie Corporation, have lent their support and counsel.

Stanford University: Dean William C. Ophuls of the Medical School of Stanford University, has served as Chairman of the Reviewing Committee. He has also stood ready at all times to assist by his counsel and advice, and has rendered important aid in the field of Pathology.

The list of topics of publications will give some idea of the scope of work being done and the men doing it.

PUBLICATIONS FOR 1924-1925

1. The Technique Involved in Measuring Destructive Changes of the Investing Tissues of the Teeth. By F. V. Simonton, D.D.S., Journal of the American Dental Association, April 1925; pp. 442-453.
2. An Examination of the Mouth with Special Reference to Pyorrhea. By F. V. Simonton, D.D.S., Journal of the American Dental Association, March, 1925; pp. 287-295.
3. The Treatment of Pyorrhea by Surgical Exposure of the Tissues Involved. By George W. Simonton, D.D.S., Journal of the American Dental Association, March, 1925; pp. 329-332.
4. A Histologic Study of the Gum in Pyorrhea. By T. D. Beckwith, Ph.D.; F. V. Simonton, D.D.S.; Adrienne Williams, M.A.; The Journal of the American Dental Association, Feb., 1925; pp. 129-153.
5. The Cytology of Endamoeba Gingivalis (Gros) (Brumpt) Compared with that of E. Dysenteriae with Special Reference to the Determination of the Amoebas in Bone Marrow in Arthritis, by C. A. Kofoid, Ph.D., Sc.D.; Olive Swezy, Ph.D., Journal of the American Dental Association, Feb., 1925; pp. 175-196.
6. A Conservative Method for the Treatment of Pyorrhea, by F. V. Simonton, D.D.S. The Journal of the American Dental Association, Feb., 1925; pp. 197-202.
7. Diet of Prisoners at San Quentin, by L. L. Stanley, M.D., Journal of the American Dental Association, Feb., 1925; pp. 161-165.
8. Bacterial Factors in Pyorrhea Alveolaris, by Ivan C. Hall, Ph.D.; Clayton Westbay, D.D.S., The Dental Cosmos, Feb., 1925; pp. 115-124.
9. Mineral Metabolism of Adult Men, by Guy W. Clark, Ph.D., Journal of Biological Chemistry, Vol. 63, Bef., 1925; p. 20 (abstract).

PAPERS, REPORTS, DISCUSSIONS, ETC.

1. The Anaerobic Flora of the Mouth by Ivan C. Hall, Ph.D.; Beatrice Howitt, A.B. Presented at meeting of the Society of American Bacteriologists, Washington, D. C., Jan., 1925.
2. The Anaerobic Bacteria of the Oral Cavity, by Ivan C. Hall, Ph.D.; Beatrice Howitt, A.B., presented before the Western New York Branch of the Society for Experimental Biology and Medicine, April, 1925.
3. Mineral Metabolism of Adult Men, by Guy W. Clark, Ph.D. Presented before the Biochemical Section of the Federated Biological Societies, Washington, D. C., December, 1924.
4. Relationship of Irritation to Histologic Changes in the Gum, by T. D. Beckwith, Ph.D. Presented before the San Francisco County Dental Society, April, 1925.
5. Cell Stimulation and Cell Division, by T. D. Beckwith, Ph.D. Presented fore the Pacific Coast Society of Orthodontists, June, 1925.
6. Bacterial Factors Causing Irritation of the Gum and Effects Produced, by T. D. Beckwith, Ph.D. (A series of

three lectures presented before the Senior Class of the University of California College of Dentistry, March, 1925.)

7. General Discussion of Bacteria, Particularly as Regards Their Relationship to the Teeth, by T. D. Beckwith, Ph.D. Radio Talk—KLK—Oakland Tribune, July, 1924.
8. Discussion of paper presented before Alameda County Dental Society on "Relationship of B. acidophilus to Dental Caries." By Dr. Russell Bunting, April, 1925.
   Discussion by T. D. Beckwith Ph.D.
9. Discussion of paper presented before the California State Dental Association, entitled: "Can We Establish Immunity to Pyorrhea?" by Dr. Walter Hughes, May, 1925.
   Discussion by T. D. Beckwith Ph.D.
10. Biologic Aspects of the Pyorrhea Problem, by F. V. Simonton, D.D.S. Presented before the joint meeting of the Medical and Dental Societies of Santa Barbara County, California, March, 1925.
11. Group Study of Pyorrhea, by F. V. Simonton, D.D.S. Presented before the Phi Sigma Society of the University of California, October, 1924.
12. Classification of Pyorrhea, by F. V. Simonton, D.D.S. Presented before the California State Dental Association, May, 1925.
13. Diseases of the Teeth, by F. V. Simonton, D.D.S. Radio Talk—KLK—Oakland Tribune.

Manuscripts Awaiting Publication

1. The Dark—Field Microscope in Pyorrhea and Oral Infections, by T. D. Beckwith, Ph.D. Journal of the American Dental Association.
2. The Occurrence of Clasmatocytes in Oral Conditions Related to Pyorrhea, by T. D. Beckwith, Ph.D. and L. F. Morrison, M.A. Journal of the American Dental Association.
3. Experimental Intra-tracheal Infection with B. tuberculosis, by T. D. Beckwith, Ph.D., and R. J. Millzner. The American Review of Tuberculosis. (This is a correlated research, not a part of the Group project proper.)
4. The Anaerobic Flora of the Mouth. By Ivan C. Hall, Ph.D., and Beatrice Howitt, A.B. Journal of Infectious Diseases.
5. Studies of Micrococcus Gazogenes—an Anaerobe of the Oral Cavity, by Ivan C. Hall, Ph.D. Journal of Infectious Diseases.
6. The Recovery of Bacteriophage from the Saliva—its Relation to Oral Conditions. Ivan C. Hall, Ph.D., A. P. Batchelder. Journal of Infectious Diseases.
7. Focal Infection: A Medical Dental Problem, by F. P. Wisner, M.A., M.D. California and Western Medicine.
8. What do you know about Pyorrhea? by F. V. Simonton, D.D.S. Better Health.
9. A Study of the Relation of Micro-Organisms to Pyorrhea and its treatment. By A. P. Batchelder, Journal of the American Dental Association.
10. Cultivation of Endamoeba Gingivalis (Gros) University of California Publications in Zoology, Vol. 28, by Beatrice Howitt, A.B.
11. Mitechondria and Golgi Bodies in Endamoeba Gingivalis (Gros) (Brumpt) University of California Publications in Zoology, Vol. 28. By D. Causey.

Completed Manuscripts

The following manuscripts are undergoing final revision before submitting them for publication:

1. A Comparative Dental Study of Mexicans and Whites, by L. L. Stanley, M.D., and F. V. Simonton, D.D.S.
2. Radiographic Standardization, with Special Reference to Pyorrhea Research, by F. V. Simonton, D.D.S.
3. Dental Focal Infection (a case history report), by F. V. Simonton, D.D.S.
4. A Comparative Study of the General Systemic and Dental Conditions of Fourteen Students, by F. P. Wisner, M.A., M.D.
5. Studies of the Incipiency and Localization of Pyorrhea, by Willard C. Fleming, D.D.S.

MANUSCRIPTS IN COURSE OF PREPARATION

1. Studies of the Relative Incidence of Pyorrhea and Dental Caries by Clayton Westbay, D.D.S.
2. Studies of Pyorrhea-like Lesions in Dogs, by F. V. Simonton, D.D.S.
3. Histologic Technic by Adrienne Williams, M.A.
4. Destruction and Repair of the Dental Tissues Following Trauma in the Experimental Animals, by T. D. Beckwith, Ph.D., W. C. Fleming, D.D.S.
5. Studies of Possible Increase of Local Immunity in the Gum, by T. D. Beckwith, Ph.D., George W. Simonton, D.D.S., Miss Rose.
6. Bacterial Factors Causing Irritation, by T. D. Beckwith, Ph.D.
7. Inorganic Constituents of Saliva and the Effects of Dietary Changes on These Constituents, by Guy W. Clark, Ph.D.
8. Mineral Metabolism of the Human Adult, by Guy W. Clark, Ph.D.
9. Studies of Repair Following Surgical Trauma of the Dental Investing Tissues in the Dog, F. V. Simonton, D.D.S., Martha Jones, Ph.D.
10. Further Studies of the Histopathology of Pyorrhea in Man, by F. V. Simonton, D.D.S.
11. A Definition and Classification of Pyorrhea, by F. V. Simonton, D.D.S.
12. The Present Status of the Knowledge of Pyorrhea, by F. V. Simonton, D.D.S.
13. Clinical Studies of Pyorrhea, by F. V. Simonton, D.D.S.
14. Focal Infection by Hans Lauper, D.D.S.
15. Root-canal Therapy in Reference to Apical Pathology, by Hans Lauper, D.D.S.
16. Further Observations on the Cultivation of Endamoeba Gingivalis (Gros). by Beatrice Howitt, A.B.
17. Studies on Endamoeba Gingivalis, by Horace J. Child, A.B.
18. The Local Distribution of Endamoeba Gingivalis in the Human Mouth, by Horace J. Child, A.B.

VISITORS

The Group has received numerous visitors during the year, from men who have spent from several hours to three or four days in becoming acquainted with the work. Amongst these visitors were:

Dr. Henry S. Pritchett, President of the Carnegie Foundation for the Advancement of Teaching, New York.

Dr. R. H. Volland, Secretary-Treasurer of the Scientific Foundation and Research Commission of the American Dental Association, Iowa City, Iowa.

Dr. Russell Bunting, Professor of Dental Pathology and Research University of Michigan.

Dr. Herman Prinz, Professor of Materia Medica and Therapeutics, University of Pennsylvania, College of Dentistry (Thomas W. Evans Museum and Dental Institute).

Dr. W. S. Wilkinson, Principal of the Melbourne University School of Dentistry, Melbourne, Australia.

Dr. S. O. Clayton, United States Navy.

9. WEST TEXAS DENTAL SOCIETY

The personnel consists of

F. O. Hetrick, advisor
C. A. Pierle*

Two assistants

The investigation covers: Brown Stain or Mottled Enamel, found in West Texas and thought to be the same type of tooth defect as is found prevalent in several other areas of the United States.

This problem is being attacked from two angles:

(a) Nutritional
A rather extended breeding and feeding experiment on animals (rats and guinea pigs) is being conducted.

(b) Chemical
1. Waters and foods have been analyzed in an attempt to determine whether the foods and waters of the Texas area are deficient or over supplied with certain elements.
2. A Chemical investigation on the composition of the brown stain areas is also being carried on.

About one hundred and twenty-five animals are being used in this work at the present time. Most of the animals have been reared at the local station. The nature of the attack makes such a procedure desirable.

P. R. Howe and Theo. Beust are cooperating in this work as materi: l is obtained and supplied to them.

PUBLICATIONS AND DISCUSSIONS

"Brown Stain and Mottled Enamel."
To be presented at A. D. A. Meeting, 1925.

10. DENTAL INDEX BUREAU

The personnel consists of

A. D. Black, director
E. M. Bebb
Mrs. Flora B. Mann*
Mrs. W. P. Warner*

During the past year steady progress has been made in indexing our periodical literature and another volume of the Index, covering the ten years, 1876-1885, has been published. The Board of Trustees of the American Dental Association voted at its March meeting this year to take over the financing of the work of the Index Bureau. The money for this purpose was appropriated out of the Library Fund. Such an arrangement will materially hasten the completion of this work.

Possibly, it should be stated again that all of this work is being done in the library on the third floor of Dr. Black's private residence in Evanston. The women employed devote their entire attention to this work under the most favorable conditions of quiet and without interruption.

11. NEBRASKA STATE HOSPITAL

F. O. Hetrick, advisor
E. A. Thomas*

The Investigation covers: The relation of dental disorders of all types to insanity and mental disturbances. This is a continuation of the work outlined in the 1923-1924 report. During the prosecution of this work a great effort has been made to collect and study statistics of State Institutions, Smithsonian Institute, Bureau of American Ethnology and various other sources that have been compiled and published. A dental survey has been made at The Industrial School for Boys at Kearney, Nebraska, and the State Training School for Girls at Geneva. A group of selected cases from the Hastings Public Schools has been studied. Besides these examinations many individuals in other walks of life have been studied.

During the last two years at the State Hospital for Insane, observations have been continued on the effects of dental care (of all types—eradication of infections, impactions, disused teeth and over-used teeth, gingival lesions, restorations, etc.). A report on this work will be made at Louisville.

PUBLICATIONS AND DISCUSSIONS

"The Retrogression of Facial Prognothaisis and the Present Results in the Human Race."

Nebraska Academy of Science—Dental Summary.

12. BUREAU OF STANDARDS, WASHINGTON, D. C.

At the last annual meeting of the Commission which was held in Dallas a grant of $600.00 was authorized to assist in establishing a working relationship with the Bureau of Standards as outlined in the 1923-1924 report provided arrangements satisfactory to both the Bureau and the commission could be made. A committee composed of Barber, Brown and Volland was appointed by the chairman. This committee was instructed to carry on further negotiation. Barber and Brown visited the bureau but up to the present time satisfactory arrangements have not been established.

The Secretary-Treasurer's books and accounts were checked and audited on June 30, 1925, and an official copy of the audit is in the hands of the chairman. The following is a copy:

Iowa City, Iowa, July 25, 1925.

Dr. R. H. Volland, Treasurer,
Scientific Foundation and Research Commission of the American Dental Association,
Iowa City, Iowa.

Dear Sir:

I herewith submit report of the condition of your account as Treasurer, beginning July 1, 1924, and ending June 30, 1925.

RECEIPTS RESEARCH FUND

Balance, July 1, 1924	$ 5,002.45
Annual dues	91.00
Sale of Bonds	20,157.43
Interest on Bonds	445.07
Profit on bonds	159.44
Interest on Savings Account	464.18
Overdraft	428.27
Total	$26,747.84

DISBURSEMENTS RESEARCH FUND

Meetings	$ 498.04
Expense of Administration	1,510.53
Minnesota	3,622.75
Forsyth	3,852.00
Dental Index Bureau	1,992.00
Northwestern University	2,400.00

California	1,805.00
California Stomatological Research Group	1,425.00
Louisville	1,500.00
Michigan	1,800.00
West Texas Dental Society	939.00
Nebraska State Hospital	500.00
Creighton	300.00
A. D. A.	4,603.52
	$26,747.84

CHECKS OUTSTANDING ON JUNE 30, 1925

No.	Amount
940	$ 35.00
2	27.00
4	36.00
5	100.00
6	100.00
7	125.00
8	81.00
9	10.00
50	35.00
1	125.00
2	125.00
3	140.00
4	32.50
5	100.30
6	32.34
7	67.34
8	31.50
9	300.00
This makes a total of checks outstanding of	$1503.23
Deduct balance as shown by bank on June 30th	1074.96
Overdraft as shown in above report	$ 428.27

Respectfully submitted,

J. E. GATENS, *Teller*,

First National Bank of Iowa City, Iowa.

July 31, 1925.

Dr. R. H. Volland,
City.

DEAR DR. VOLLAND:

As requested, we hereby certify that the balance to your credit, as Treasurer of the National Research Commission, at the close of business June 30, 1925, as shown by our books, was $1074.96.

Respectfully,

THOS. FARRELL, *Cashier*,

(First National Bank, Iowa City, Iowa.)

The item "Annual dues" ($91.00) represents the payment of dues that were in arrears at the time of the American Dental Association meeting in Cleveland, 1923.

At the end of the fiscal year 1922-1923, a balance of $24,963.37 was on deposit with the Farmers Loan and Trust Company. With an idea of safeguarding these funds, Liberty Bonds were purchased. During the period of July 1, 1923, to June 30, 1925, the income of the Commission has been so small that these bonds have been sold. A statement of these transactions appears in this year's audit. (see above)

The balance deposited in the Savings Account with the Farmers Loan and Trust Company bore 4 per cent interest compounded semi-annually. $464.18 was received during the present fiscal year from this source.

The Executive Board has held two meetings during the fiscal year 1924-1925 at which time routine business was transacted. The mid-year meeting was held January 20 and 21, 1925 (2 days). The second meeting was held on June 28, 1925. At this second meeting provisions were made to continue work under the various grants during the period from the end of the Commission's fiscal year (June 30, 1925) to the annual meeting of the Commission at Louisville, September 20, 1925.

The expenses of these meetings are as follows:

January 20 and 21, 1925—the five members of the Board were present for two days	$ 366.86
June 28, 1925—Three members of the Board were present	131.18
Total	$498.04

An analysis of the expenses of administration is as follows:

(1)	**Chairman's office**	
	Stenographer 12 mos. at $60.00	$ 720.00
	Stenographic Service at Dallas	4.00
	Postage	5.00
(2)	**Secretary-Treasurer's office**	
	Stenographic Service 12 mos.	383.94
	Postage, Telephone and Telegrams	31.50
	Paper, Carbons, Clips, Index, Folders, Envelopes and Stamp	15.10
(3)	**General**	
	Printing	46.60
	Safe Deposit Box	6.00
	Room at Dallas—for Executive Board	6.00
	Reprints of 1923-1924 Report	12.36
(4)	Conference with Bureau of Standards Officials, Washington, D. C.	
	L. L. Barber	63.89
	H. C. Brown	64.82
(5)	Visiting and inspecting work at Grants	
	F. O. Hetrick, Visiting State Hospital, Hastings, Nebr.	31.93
	L. Meisburger, Visiting Forsyth and Harvard Medical and Ferris	86.99
	R. H. Volland, Visiting Creighton University	32.50
		$1,510.53

STATEMENTS OF GRANTS JUNE 30, 1925

	Grant	Disbursement
1. University of California	$2000.00	$1805.00
2. Creighton University	300.00	300.00
3. University of Louisville	1500.00	1500.00
4. University of Michigan	1800.00	1800.00
5. University of Minnesota	4200.00	3622.75
6. Northwestern University	2400.00	2400.00
7. Forsyth Dental Infirmary and Harvard University	4000.00	3852.00
8. California Stomatological Research Group	1500.00	1425.00
9. West Texas Dental Society	1000.00	939.00
10. Dental Index Bureau	1742.00	1992.00

11. Nebraska State Hospital, Hastings	500.00	500.00
12. Bureau of Standards	600.00	None
Total	$21542.00	$20135.75

At the last annual meeting of the Commission in Dallas, $1742.00 was appropriated to the Dental Index Bureau for the period of July 1st to Jan. 1st, 1925. At the mid-winter meeting of the Executive Board on Jan. 20, 1925, further appropriations were made in order to carry on the work of the Bureau until March 19, 1925, when the Trustees of the American Dental Association were to meet and at which time the secretary of the commission was instructed formally to request the Trustees to take over the financing of the work of the Bureau—the funds to be appropriated out of the "Library Funds" of the American Dental Association.

The Trustees acted favorably on the request and made suitable appropriations to the Bureau.

An appropriation of $600.00 to the Bureau of Standards at Washington, D. C., was approved at the last annual meeting of the Commission, provided satisfactory working arrangements could be formulated. Up to the present time a satisfactory plan has not been evolved, therefore no expenditures from this fund has been made.

Owing to the controversy that arose over the rise and apportionment of dues voted on at the Cleveland meeting of the American Dental Association, all money apportioned to research has been held in trust by the Treasurer of the American Dental Association until the controversy is finally settled by the House of Delegates. Before the decision to hold all money representing a rise in dues had been made, the Treasurer of the American Dental Association had remitted to the Research Commission the sum of $4,603.52. This was returned to the Treasurer of the American Dental Association by the Research Commission Check No. 725 on July 5, 1924. (See item "A. D. A." in Disbursements.)

This report is made at the end of the first five year period since the work in the Institute in Cleveland was discontinued. The following tables may be of interest:

GRANTS APPROVED BY THE SCIENTIFIC FOUNDATION AND RESEARCH COMMISSION OF THE AMERICAN DENTAL ASSOCIATION

Fiscal Year July 1st, to June 30th.

Location	1920-21	1921-22	1922-23	1923-24	1924-25	Total
University of Minnesota	$4000	$4000	$4200	$4200	$4200	$20600
Forsyth Dental Infirmary and Harvard Medical School	1000	2000	3000	4000	4000	14000
University of California	500	1200	2000	2000	2000	7700
Chicago College of Dental Surgery	**	1200	2400	2400	**	6000
Dental Index Bureau	**	3000	3000	3000	1992	10992
Northwestern University Dental School	**	1200	2400	2400	2400	8400
H. C. Ferris	**	1000	1000	1000	**	3000
University of Michigan	**	**	1800	1800	1800	5400
University of Louisville Dental School	**	**	1500	1500	1500	4500
Creighton University Dental School	**	1000	1000	1000	300	3300
West Texas Dental Society	**	**	**	1000	1000	2000
California Stomatological Research Group	**	**	**	1500	1500	3000
California State Hospital	**	**	**	500	500	1000
W. A. Gray	**	900	**	**	**	900
Bureau of Standards	**	**	**	**	900	900
Totals	5500	15500	22300	26300	22092	91692

EXPENDITURES

	1920-21	1921-22	1922-23	1923-24	1924-25
University of Minnesota	$3626.57	$2983.90	$3954.55	$3659.25	$3622.75
Forsyth Dental Infirmary and Harvard Medical School	750.00	1527.00	2943.42	3077.49	3852.00
University of California	500.00	900.00	2077.33	2000.00	1805.00
Chicago College of Dental Surgery	**	900.00	2375.00	25.00	**
Dental Index Bureau	**	2852.55	3361.85	2795.25	1992.00
Northwestern University Dental School	**	1200.00	2200.00	2200.00	2400.00
Henry C. Ferris	**	1000.00	1000.00	150.00	**
University of Michigan	**	**	1800.00	1800.00	1800.00
University of Louisville Dental School	**	**	1125.00	1500.00	1500.00
Creighton University Dental School	**	**	**	416.66	300.00
West Texas Dental Society	**	**	**	88.87	939.00
California Stomatological Research Group	**	**	**	1500.00	1425.00
Hastings State Hospital	**	**	**		500.00

W. A. Gray	**	**	**	**	
Bureau of Standards	**	**	**	**	**
Totals	$4876.57	$11363.45	$20837.15	$19212.52	$20135.75

The following table summarizes the income of the commission since 1921-1922:

	Year 1921-1922	Year 1922-1923	Year 1923-1924	Year 1924-1925
Annual dues received by Sec'y-Treas.	$23,999.10	$23,537.70	$3,979.01	$ 91.00
Interest received	640.00	823.28	1,008.55	909.25
Profit on bonds				159.44
Total	$24,639.10	$24,360.98	$4,987.56	$1159.69

The Secretary of the American Dental Association informs this office that $37,381.51 is being held by the Treasurer of the American Dental Association in the research fund. This sum represents the accumulation in this fund during the last two fiscal years. It is the proportion of the annual dues voted at Cleveland. It is to be noted that the amount per year is not equal to that received by the Commission under the old plan of voluntary contribution in force prior to 1923-1924. (See Summary) and will entail considerable curtailment of the present plan of work.

The following action was taken by the Board of Trustees of the American Dental Association on March 20, 1925: "It was voted that an appropriation of $15,000.00 be made to the Research Commission to be used between now and September, 1925." No funds have been drawn from this source up to the present time.

R. H. VOLLAND,
Secretary-Treasurer.

THE PULPLESS TOOTH

FROM THE STANDPOINT OF THE GENERAL PRACTITIONER

By EDMUND NOYES, D.D.S., F.A.C.D., Chicago, Illinois

(Read before the North-Shore Branch of the Chicago Dental Society, October 13, 1925)

THE general practitioner, if he is a progressive man, desirous of keeping pace with the advance of his profession, has felt a keen interest in what has been said and written in recent years about the ability of infected teeth to cause infections, in remote places, sometimes of the most serious nature and disastrous consequences, and it is very desirable that he form sound judgments of the validity and meaning of the work of research men and that he be able to translate the assured facts that they have established into safe and wise rules of practice.

The most obvious and important conclusion from the research work hitherto accomplished is that root-canal operations should be done with much more care and thoroughness than has ever been the case with a large majority of practitioners.

The most important consideration in determining whether a tooth with an alveolar abscess is curable or not is the question as to whether the root end has

become denuded of its periodontal membrane. If that is the case, the cementum of the root becomes incurably infected, and the denuded portion must be cut off or the tooth extracted. The periodontal membrane, however, is a rather persistent tissue, and a roentgen-ray examination will not always disclose whether the root is denuded or not. Dr. Hatton[1] has shown that an abscess sac will sometimes be folded upon itself similarly to the indentation of a soft rubber ball by pressure of a finger so that the roentgen ray will show the root projecting into an abscess cavity while the periodontal membrane is uninjured, or not injured beyond repair. There is no biologic reason why such an abscess is not so amenable to complete and permanent cure as is a similar suppuration involving the bone in any other place. Of course, conditions of health or of infections elsewhere, and various other matters, may have an important bearing on the question as to whether a cure should be undertaken.

It has been asserted that the contact of dead matter with living tissues is always injurious to the latter and that the dead contents of the dental tubuli adjacent to the cementum of the root will inevitably prove injurious to the latter. Histologically, there is a line or wall of separation between the dentin and the cementum that is practically impervious to the contents of the dental tubuli. It is true that the microscopists have made out a few small channels from the cementum to the dentin, perhaps to the pulp canal. They are probably residuary from the period of development, and, like the small multiple foramina at the apex of the root that have a similar origin, are negligible as channels of harm if no infection is adjacent to them at either end. It will be said that the dentin is infected. If it has not been sterilized in the treatment of the tooth, it is probable, if not certain, that any germ life shut up between the cementum and a good root-filling will soon be smothered and killed by its own waste products. What we do not know about the dental tubuli and their contents greatly exceeds what we do know. These histologic and biologic considerations would seem to furnish a reasonable expectation that a well-filled pulpless tooth may remain in its place indefinitely, supported in its life and function by the vitality in its periodontal membrane and cementum. It is even supposable that the living cementum of such a tooth may sometimes close its openings by a physiologic deposit of calcarious material.

It has been asserted that every tooth with a filled root is infected in the apical region or soon becomes so after being filled. There are a great number of such teeth that present a clinical picture of health and healthy function, equally with the teeth having living pulps adjacent to them, and a great number continue to do so to the end of life.

Such clinical observations furnish an exceedingly strong presumption that the teeth in question are not infected. Of course, every one knows that a lamentably large number of teeth with filled roots do become infected and remain so until extracted, but that all of them do so is an unwarranted assumption at present. Dr. Hatton affirms that some filled roots have been examined that did not show conclusive evidence of infection. It is very probable that a pulpless tooth that has a well-filled root

1. Hatton, E. H.: Tr. Illinois Dent. Soc., 1925.

and is free from infection may be more susceptible than a tooth with a living pulp to infection from the blood stream if the blood has become contaminated by some infection elsewhere.

It is much easier to condemn all pulpless teeth to the forceps than to discriminate carefully and successfully between those that should be condemned and those that can be treated so as to be retained in usefulness and safety. Condemning them all saves the dentist much trouble but it makes much trouble for the people who lose the teeth.

DISCUSSION

E. H. Hatton, Chicago, Ill.: I shall take only one exception to the statements that Dr. Noyes has made. I cannot agree that dead men and extracted teeth tell no tales.[2] A long experience in performing necropsies has taught me that the bodies of dead people yield evidence that is invaluable and that even may be used in convicting men of the crimes that they have committed. All that I have learned about pulpless teeth has been obtained from the studies that have been made on extracted teeth by bacteriologic and histologic methods.

From these examinations, I have been convinced that the root canals of teeth can be treated and filled with a reasonable degree of success provided only that the structures at the apex are conserved, that the filling operation is technically excellent and that the capacity of the apical tissues to regenerate is not hopelessly handicapped by the age and state of nutrition of the patient or by previous infection of the region at the apex. It should be obvious that a considerable suppurative detachment of the apical periodontal membrane must prevent regeneration of the apical region no matter how carefully the tooth is treated.

After all, the best test of a technic or method of procedure is to try it. This is typical of American practice and philosophy. If it works, if it succeeds, it is right, it is true. No one is more thoroughly convinced than I am of the harm done to a great number of individuals by mouth infection, and of the necessity for its eradication wherever found. On the other hand, I am not yet convinced that mouth infection in the majority of individuals is so great a menace to the health, as many would have us believe. On this account, when the occasion justifies it, I believe we can and should use more conservative methods in treating diseased teeth than universal extraction. Such a method has succeeded in the hands of many careful, experienced dentists, like Dr. Noyes, and its utimate standing, after all, will depend on the degree of success or failure obtained by the average dentist in applying it to his practice.

2. Dr. Hatton refers to some remarks made by Dr. Noyes after reading his paper.

AMPHIBIANS*

By J. S. FOOTE,† A.B., M.D., LL.D., Omaha, Nebraska

AMPHIBIANS lead dual lives, as the name implies, living in water and on land. This could not be if the histology and physiology of the preceding vertebrate had not been changed, and this, perhaps, marked the most important transformation in the history of vertebrates.

Obedient to the inexorable biologic law of differentiation and development in operation in the fishes or first vertebrates, the amphibians reached a point in the constitution of their organizations when they left the water, and the organs of locomotion which had, for ages, been sufficient for a change of location in water, acquired an especial adaptive change to meet the requirements of locomotion on land.

By a rearrangement of the constituent parts of the anterior and posterior fins, these organs have been transformed into anterior and posterior limbs as these vertebrates successfully emerged from an aquatic to an atmospheric life.

This remarkable change in biologic level was further made possible by a corresponding change in tissue metabolism. Obviously, the fish could not breathe the air nor move about on land in search of food. A reorganization of the whole animal on a higher plane was necessary. The amphibians, therefore, were the first vertebrates equipped with levers of bone and respiratory organs to meet the new conditions that prevailed on land, the permanent abode of advancing vertebrates. A new value was given to bone when vertebrates began to walk. From the Silurian to the Carboniferous Age of the world, an immense stretch of time was involved, and it was during this period that the fish was raised to a higher level, from which it claimed both air and water as its domain.

In the foregoing chapter on the bone and teeth of the primitive fishes,[1] we saw three bone types of differentiation; viz., lamellar, laminar and haversian system. These were represented as recognizable in the lamellar or in outline in the laminar and haversian system types.

It may be further stated that cross-sections of the femora of thirty-nine amphibians have been examined microscopically to determine the type of differentiation present. Of these, thirty were lamellar, one lamellar and laminar, seven lamellar and early haversian system and one lamellar, laminar and early haversian system types; that is, an advance in bone type of differentiation was evident, although no type had reached its culmination. The majority—thirty—remained true to the higher primitive lamellar or fish type, one had advanced to the lamellar and laminar type, seven had reached the lamellar and early haversian system

*Work done under grant by the Scientific Foundation and Research Commission, American Dental Association.

†Deceased, June 30, 1925.

1. Foote, J. S.: The Bowfin—Amia Calva; Histology of the Bone and Teeth, J.A.D.A., 11: 497 (June) 1924.

type and one had reached the lamellar, laminar and early haversian system type. This means that the amphibians were not all true to one and the same type, but showed an advancing differentiation. While the amphibian advance in type is not great, as might be expected, it is, nevertheless, an advance that function does not account for. Biologic movements are slowly and gradually rising to an objective by a force that tends toward a higher level of organization. The reverse of this destroys the conception of the true nature of life as we understand it. Bone and teeth are the only tissues that remain for ages after death to tell the story of progression through the long struggle of the life of the vertebrate and its arrival at a final state of culmination. If bone and teeth had remained stationary from the beginning to the end of vertebrate life or from fish to man, there would be no valid reason for thinking that a biologic advance was in progress; at least, as far as material evidences are concerned, since the soft tissues so soon return to the chemical elements of their decomposition. But just the opposite is true: they have not remained stationary, but show an ever-changing variation in their structural units from the simplest unorganized bone and tooth substances in the fish to the most complex haversian system in man. One of our greatest difficulties is found in properly estimating the true value of the minute variations by which biologic advances are made. They are not made by leaps and bounds, but by almost imperceptible gradations. It is by comparing the different classes of vertebrates with each, and the first with the last class, that we are able to recognize the valuations of progressive differentiations. In accordance with our belief that bone advance in type means tooth advance because of tissue kinship operated on by a common biologic law toward a culmination of type, the following examinations of bone and teeth of the amphibians have been made and are herewith presented for comparative purposes.

THE BULLFROG

Plate I presents sixteen sections of the teeth and bone of the bullfrog.

Figure 1. Diagram of the upper jaw of a large bullfrog—*Rana catesbeiana*—showing the maxillary and vomerine teeth: *A*, maxillary teeth, which in this particular frog numbered more than 200; *B*, one of two clusters of eight vomerine teeth, on either side of the median line, the central tooth in each cluster being the largest; *C*, a new tooth springing up at the base of the old tooth and gradually displacing it; *D*, sphenethmoid bone.

At first sight, the large number of teeth on the upper jaw—maxillary and vomerine—does not admit of so ready an explanation on the basis of function as it does on the basis of a biologic development. The teeth are usually described as prehensile, but with teeth on the upper jaw and nothing on the lower jaw excepting a soft oral membrane to serve as an occlusal surface, the thought of prehension as the most essential function of the teeth is not wholly satisfactory, as it seemed to be in the teleost fishes; but the idea of prehension becomes much more clearly evident when we consider the double curve of the two jaws, one of which is a concavo-convex curve equal to the arc of a circle with a 55 mm. radius and the other a lateral curve equal to the arc of a circle with a 55 mm. radius. The jaws close very tightly, and

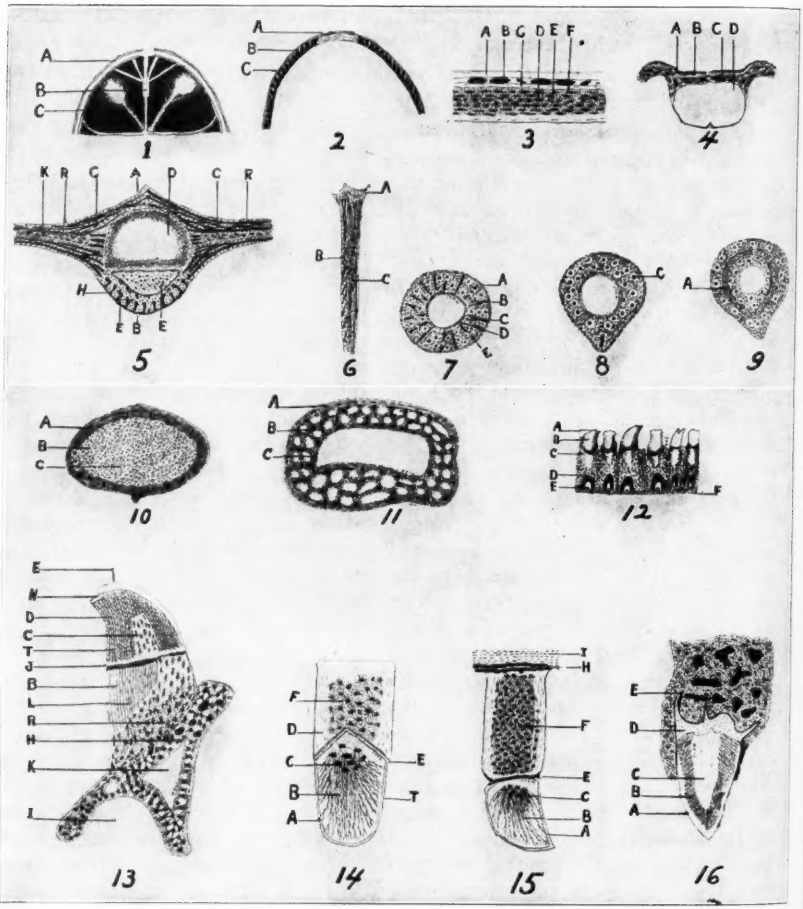

Plate I.—Sections of the teeth and bone of the bullfrog. Fig. 1. Diagram of the upper jaw of a large bullfrog—*Rana catesbeiana*. Fig. 2. Concavoconvex curve of the tooth surface. Fig. 3. Diagram of the lower jaw. Fig. 4. Cross-section of a vertebra extending into the ribs. Fig. 5. Longitudinal section of the urostyle. Fig. 6. Cross-section of the lower jaw at *A*, Figure 3. Fig. 7. Cross-section of the femur of a large bullfrog. Fig. 8. Cross-section of the femur of a medium sized bullfrog. Fig. 9. Cross-section of the femur of a small bullfrog. Fig. 10. Cross-section of the last rib of a large bullfrog—*Rana catesbeiana*. Fig. 11. Cross-section of the brain case. Fig. 12. Maxillary teeth. Fig. 13. Cross-section of the maxilla with a tooth in position. Fig. 14. Maxillary tooth and bone ground flatwise. Fig. 15. Maxillary tooth and bone ground flatwise. Fig. 16. Vomerine tooth and bone ground flatwise.

the short, sharp, curved teeth of the upper jaw, by closing tightly on the lower jaw, make prehension secure by the combined action of the two curved jaws and maxillary teeth, and this is, furthermore, reinforced by the voluntary assistance of the anterior limbs. In Figure 2 is shown the concavo-convex curve of the tooth surface: *A*, upper jaw; *B*, tooth curve, and *C*, lower jaw. In Figure 1, the lateral curve of the jaws may be seen. Prehension, therefore, is accounted for as much by the double curved jaws as by the teeth.

Figure 3. Diagram of the lower jaw. The lower jaw is hinged to the upper at a point posterior to the eyes which gives a very wide gap to the mouth when the jaws are opened. It has the same curves as the upper jaw. *A*, point where a cross-section was made, the section being shown in Figure 6. *B*, region of attachment of an eversible tongue. The jaw bone is absolutely destitute of teeth and covered with a soft oral membrane.

Figure 4. Cross-section of a vertebra extending into the ribs. The frog has nine vertebrae and a long extension of bone articulated to the last vertebra and called the urostyle. *A*, body of vertebra surrounded by a lamellar or first type bone. The lacunae are long and narrow and their canaliculi are long and straight—characteristics of the later differentiation of the lamellar type of bone. Within this lamellar layer, the structure is limited almost entirely to the early haversian system type, so that we find an evident advance in bone type beyond that observed in the vertebrae of the teleost fishes. *B*, neural canal enclosed by a wall of lamellar and early haversian system bone types, as seen at *C*. Between this wall and the anterior surface wall, there is a more or less circular area of early haversian systems as seen at *D*, a short extension into a rib and composed of the same bone types is seen at *E*, and *N*, canal of notochord.

Figure 5. Longitudinal section of the urostype, the articulated extension of the vertebrae. This bone is 55 mm. long and, 4 mm. wide, and has a third dimension of 5 mm. It is the shape of a flat key, with a slot in the key blade. *A*, articulation; *B*, central, vascular canal surrounded by well defined lamellae; *C*, a slot in which are seen groups of spherical, amorphous bodies. The section is composed of a lamellar bone interrupted by early differentiations of the haversian system.

Figure 6. Cross-section of the lower jaw at *A*, Figure 3: *A*, wall of the bone; *B*, central vascular canal. The wall of the bone is composed of well defined lamellae in which are many well defined haversian systems. The central canal is surrounded by a lamellar bone. This is the site of the original Meckel's cartilage. The lower jaw is better developed than the upper and yet is without teeth.

Figure 7. Cross-section of the femur of a large bullfrog—*Rana catesbeiana*. The section is composed of a large number of radiating, bush-like vascular canals, *A*, between which are round or oval lacunae arranged more or less concentrically on minute vascular branches, and seen at *B*; *C*, a blood vessel in the medullary canal that supplies the radiating vessels of the wall, and *D*, medullary canal filled with marrow.

Figure 8. Cross-section of the femur of a medium sized bullfrog of the same species. *A*, radiating, bush-like vascular canals; *B*, intermediate branches with their lacunae; *C*, blood

vessel of the medullary canal; *D*, medullary canal; *E*, portion of the bone composed of concentric lamellae from which the radiating, bushlike canals have been eliminated by the cumulative pressure of development.

Figure 9. Cross-section of the femur of a small bullfrog of the same species. The radiating canals have all disappeared and the section is composed of bone lamellae, as seen at *E*. In making an estimate of the relative stages of development indicated by this series of femora, the following structural changes observed in the different sections are significant as expressions of an advancing bone type and ascending levels.

Figure 7 represents a vascular bone with the minimum amount of bone substance; hence, the earliest frog (Fig. 8) represents the next in the series. The radiating, vascular, bushlike vessels have disappeared from one-third of the section, and bone lamellae have been substituted. The section shows a decided gain in bone and, therefore, a higher level of advancement, since bone organization is the end toward which this form of inorganic tissue is directed. Figure 9 represents the last or final degree of bone differentiation of this level. The radiating, bushlike vessels have all disappeared, and bone lamellae form the structure of the entire section. The lines of advance have been along the degrees of elimination and substitution; that is, the elimination of the blood vessels and the substitution of bone. Evidently, bone substance, in some degree of differentiation, is the objective of vertebrate life. The bone in Figure 7 could not arise from that in Figure 9, by way of that in Figure 8; that is, vascular canals or blood vessels could not arise from bone in a physiologic state, but bone could and would arise from the circulatory system as an objective product. These important variations in the structure of the femora of three vertebrates of the same species, but of different sizes, would indicate that the large frog was earliest, the medium-sized frog next and the small frog the latest in point of development.

Figure 10. Cross-section of the last rib: *A*, lamellar bone forming the external wall and interrupted by early differentiations of the haversian system; *B*, cancellous bone, lamellar in type, forming the central portion; *C*, crystalline and amorphus contents in the meshes of cancellous bone. The cancellous arrangement of bone serves a useful physiologic purpose in the distribution of the blood vessels and in making possible the freedom of cells in their dividing and metabolic activities.

Figure 11. Cross-section of the brain case: *A*, external, lamellar layer of bone; *B*, central, wider layer of closely set vascular canals (not haversian canals) extending lengthwise of the bone; *C*, internal layer of lamellar bone surrounding the brain cavity. The peculiar feature of this section is the very vascular bone of the central layer, which is composed of vascular canals, each one of which is surrounded by well-differentiated lamellae.

Comparing the bone sections of the frog with those which were shown of the fish, it is evident that the amphibian frog has advanced in the type of bone differentiation, since there are only rather obscure lamellae and mere outlines of haversian systems in the fish, while there are various differentiations of the haversian system in the frog.

There has been a change in bone type toward a higher objective in the frog.

This being the case, we would not expect to find the same unchanged type of tooth in the frog as we found in the fish. The cone shaped tooth has been established in the fish; this is rather gross than minute anatomy, and the multiplication of cones, as seen in later teeth, does not signify a change in histologic structure, since such a change is biologic.

Figure 12. Teeth of the maxilla as drawn from a gross specimen: *A*, notch in the enamel; *B*, dentin or tooth proper; *C*, osseous shaft; *D*, bony envelop; *E*, new tooth arising from a base of bone; *F*, bone of the maxilla. The teeth proper are very small and loosely attached to bone bases, which arise from the jaw bone. They are very closely set together and enclosed in bone, which is pigmented. Each tooth is capped with a finely striated enamel, which is notched at the tip, as may be seen at *A*. Below this is a short curved, stout body of dentin, forming the tooth proper, separated by a distinct line of demarcation from an osseous shaft seen at *C*, and this is enclosed within an envelop of bone, which is an upward extension of the jaw bone and seen at *D*. At the bases of the teeth and arising from the jaw bone are small new teeth *E*, formed within the hollow cavities of the old teeth. *F* is a bone of the maxilla. The shedding of teeth in this vertebrate, unlike that in the fish, shows a different plan. The new tooth has come from the jaw bone and displaces the old tooth by growth from below, which is suggestive of tooth displacement in the more advanced stages of development as seen in later vertebrates.

Figure 13. Cross-section of the maxilla with a tooth in position: *E*, enamel; *N*, notch in the enamel; *D*, dentin or tooth proper; *C*, chamber in the dentin; *T*, dentinal tubules; *J*, junction of the dentin or tooth proper with the bone shaft or base; *B*, bone shaft or base composed of bone substance with fine striations at the left, *L*, and bone cells in parallel rows at the right, *R*. A few small bone cells are seen in the striated portion. The cell portion, *R* is continuous with the jaw bone, *H*, and has the same cells. The jaw bone has a large central vascular canal, *K*, and encloses a larger vascular canal, *I*, at its base. The bone of the jaw is composed of bone substance in which are many large bone cells with many long uniting dendrites surrounding haversian canals. The bone shows an early differentiation of the haversian system. The central chamber of the dentin has small branching bone cells arranged in parallel vertical rows. From their location, these cells may represent the early odontoblasts of that period of development. As observed in other sections, they are extensions of the home cells of the bone shaft below. As we look at the teeth of the jaw with a 48 mm. objective, they can be seen arising from the jaw bone, as may be seen in Figure 12.

Figure 14. Maxillary tooth and bone ground, flatwise: *A*, enamel; *B*, dentin; *C*, large branching cells in the central chamber of the dentin, the branches of which form the core of the dentinal tubules. As suggested above, the cells may be early odontoblasts. They have the same general characters as the cells of the bone to which the dentin is attached. *D* represents bone, to which the dentin is loosely attached at *E*. In the center of the bone, at *F*, are seen large branching cells similar in appearance to those in the dentinal chamber. The section is especially interesting because of the cells and den-

trites of the dentinal chamber and their relations to odontoblasts.

Figure 15. Another maxillary tooth ground flatwise: *A*, enamel; *B*, dentin; *C*, large branching cells in the central chamber of the dentin; *E*, junction of the dentin with bone; *F*, large branching cells of the bone shaft; *H*, blood vessels in the jaw bone; *I*, bone of the jaw.

Figure 16. Vomerine tooth and bone ground flatwise: *A*, enamel; *B*, dentin; *C*, wide central chamber in the dentin; *D*, lamellar bone at the base of the tooth; *E*, early bone differentiation from which the vomerine teeth arise.

The especially interesting features of the teeth and bone of this amphibian vertebrate may be briefly summarized as follows:

1. The large number of teeth on the upper jaw and the complete absence of teeth on the lower jaw. By this, we may know that tooth absence in vertebrate had a remote origin. We are familiar with the fact that the first teeth in man appear on the lower jaw, which might be expected on the basis of a higher development; but it is somewhat unexpected to find that the lower jaw of the amphibian, which also has a higher bone differentiation than the upper, has no teeth whatever, and especially is this surprising if teeth and bone are really interdependent; but the biologic status of this vertebrate so willed it by a law of its being, and thereby introduced a tooth deficiency that appears now and then in all of the succeeding vertebrate classes. Who knows but that the absence of the third molars in man can be accounted for by obedience to the same biologic law? Tooth function, we may believe, is the same in all men, and functional variation could not well account for the presence of the third molars in some men and their absence in others. The latter may be an evidence of a higher biologic level.

2. The intimate association of the tooth with bone as indicated by the cells of the dentinal chamber, their resemblance to bone cells of the maxilla and the dendrites of those cells occupying the dentinal tubules.

3. Tooth shedding: the formation of new teeth at the bases of the old teeth and within them. Arising from the jaw bone and growing gradually into the old teeth, they displace them as they wear away. This suggests a later method of tooth shedding than that seen in the fish.

4. The early bone differentiation of the maxilla and the later bone differentiation of the mandible, which has retained such a relationship throughout the later vertebrates.

5. Advancing bone differentiations by which members of a species rise to higher levels, as seen in the femora of three frogs, shown in Figures 7, 8, 9. These three sections show how bone advances in type by a power that resides within the circulatory system; for it is the circulatory system that first undergoes a change in distribution, and this is followed by the different arrangements of bone substance, which are called types. The bone in Figure 7 was first and the bone in Figure 9 last in differentiation. The bone in Figure 7 represented the largest and that in Figure 9 the smallest animal, indicating that there has been a decrease in the size or mass of the animal as advancement in type took place. The animal represented in Figure 7 was a very large giant bullfrog, while that in Figure 9 was a small frog of the same species. If we compare the early fossil amphib-

ians and reptiles with the later animals of those classes, we cannot fail to notice the great reduction in size or mass as the type advances, or perhaps that fact can be better expressed by saying that reduction in the size or mass of a vertebrate is an evidence of advancement in type and a rise to a higher level in vertebrate history.

THE AMERICAN TOAD

Bufo americana-American toad.—While the toads are placed in the amphibian class by a decree of the zoologists, they have not been able to abide by that decision, since they spend most of their lives on land and seem to have a natural aversion to water instead of the special adaptation to it that the frog has.

In contrast with the frog—*Rana catesbeiana*—described above, which had a large number of teeth on the upper jaw and none on the lower jaw, the American toad—*Bufo americana*—has no teeth on either jaw. The toothless history of vertebrates is interesting, and it serves as a prophecy of the probabilities of tooth failure in the later periods of tooth service in the most highly developed mammals.

The Absence of Teeth in the Vertebrate Series.—The following article is taken in part, from Lull's "Organic Evolution" under the heading "Degeneracy," and from Parkay and Haswell's "Text Book of Zoology":

> Physical degeneracy is a trait paralleling certain senile characteristics. Among these is a loss of teeth which is recorded several times: first, among fishes such as the sturgeon and certain deep sea forms like the "gulper eel" macropharynx, which evidently feeds upon the bottom oozes. Among the amphibians as seen in the present frog—*Rana catesbeiana*, there is an entire absence of teeth on the lower jaw; in the American toad—*Bufo americana*, there is an entire absence of teeth on both jaws. The turtles, which are among the oldest of living reptiles, had lost their teeth by Triassic time, when they first appear in the rocks; among Dinosaurs; three phyla were, at the time of their extinction, rapidly losing their dental armament; the birds, which were toothed during the Age of Reptiles, have also been toothless since its close. In each of these instances the jaws are sheathed with a horny beak variously modified, so that while the turtles are fewer than of old, the birds, except for man's interference, can hardly have begun to wane as a whole, although many races are extinct. Among mammals the Monotremes have no dentiniform teeth, but have teeth of horn. Teeth are sometimes absent in the upper jaw of sperm whales and entirely absent in the whalebone whales.
>
> In the Edentates as the sloth, armadillo and ant-eater, there is a great loss of teeth, in the vegetable feeding Rodents, there are no canines, two incisors in the upper and lower jaws. In the Ruminants, among Ungulates, teeth are absent in the upper jaws, the lower incisors biting against a horny pad. In man, among Primates, the lateral incisors and third molars are disappearing, in cleft palate the teeth are developmental failures; while in tooth cavities may be seen the beginnings of the tooth losses of modern man.

This is an interesting account of tooth history. Tooth losses seem to have been the rule and not the exception in the vertebrate series. If we go back to the fossils in our investigations, there are indications in the monuments of early vertebrate life that teeth were more often present and were in better form than they are in the later periods of development; in other words, teeth have been falling off in their power of differentiation ever since they started. They are highly specialized calcium compounds, even at first, because the cells which produced their constituent parts operated under their pristine vigor, which had not been impaired by long tumultuous demands. From the nature of the case, the more highly specialized organs were the first to decline in the wear and tear of time and a changing geologic environment. It is not be-

cause the calcium salts are failing in their chemistry that modern teeth are becoming poorer, but because the bond of union between the calcium salts and protoplasm has been slowly and gradually failing and the consequent release of these parts, the one from the other,

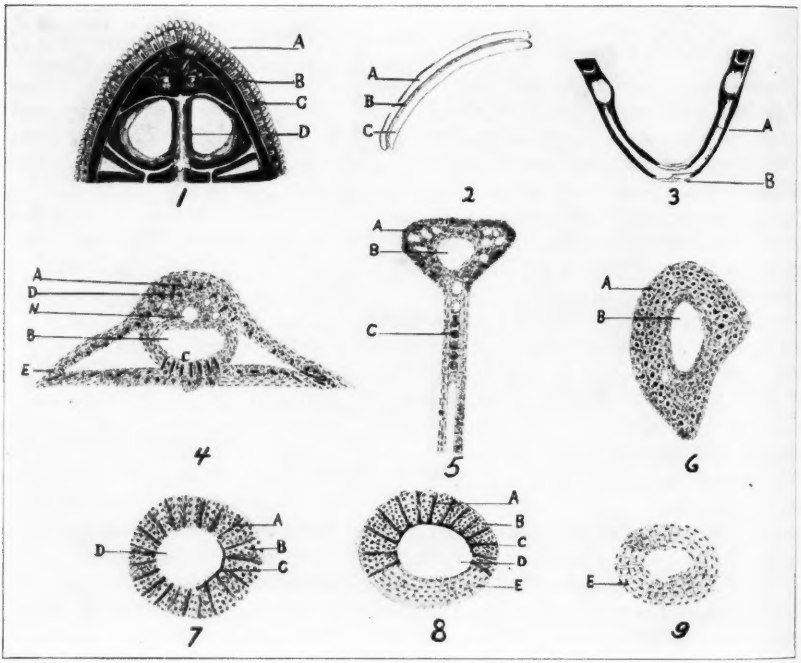

Plate II.—Bone sections of a toothless vertebrate—*Bufo americana* (American toad). Fig. 1. Drawing of the upper jaw and roof of the mouth. Fig. 2. Drawing of the lower jaw. Fig. 3. Longitudinal section of the lower jaw. Fig. 4. Cross-section of the brain case. Fig. 5. Cross-section of a vertebra and portion of the ribs. Fig. 6. Longitudinal section of the urostyle. Fig. 7. Cross-section of the right femur at its midline. Fig. 8. Cross-section of the left femur at its midline. Fig. 9. Cross-section of the right femur of another toad of the same species.

has contributed to the tooth losses in vertebrate history.

Plate II shows the following bone sections:

Figure 1. Drawing of the upper jaw and roof of the mouth of *Bufo americana*: *A*, upper jaw, which is entirely devoid of teeth; and having an outer and inner rim separated by a concave furrow; *B*, bony framework of the head; *C*, eye stalks.

Figure 2. Drawing of the lower jaw: *A*, site of the eversible tongue; *B*, rim of jaw; *C*, soft tooth-shaped bodies having the appearance of being flattened against the upper surface of the jaw.

Figure 3. Longitudinal section of the lower jaw showing the structure:

A, horny rim; *B*, vascular canal in cross-section; *C*, upper portion of a horny sheath surrounding the bone; *D*, central core of bone composed of a central body of large, branching bone cells, *E*, in bone substance, enclosed by a sheath of bone *F*, with long lacunae and long straight canaliculi, thus showing differentiation of bone later than the central core. The bone is the successor of Meckel's cartilage.

Figure 4. Cross-section of the brain: *A*, pigmented skin; *B*, underlying supporting tissue; *C*, bone of skull composed of thin external and internal plates of bone of unlike differentiations, the external plate being the most highly differentiated; *D*, brain cavity.

Figure 5. Cross-section of a vertebra and a portion of the ribs: *A*, dorsal; *B*, ventral portions; *C*, layers of bone substance alternating with parallel blood vessels extending into the ribs; the bone substance having small, oval lacunae and short, bushy canaliculi; *D*, neural canal surrounded by a narrow ring of lamellae; *E*, remains of the notochord, which is first areolar tissue, the areolae of which are filled with a liquid derived from the blood, which gives it some rigidity, next, hyaline cartilage, and, last, bone; *F*, ventral body composed of bone substance in which are seen short radiating blood vessels derived from a circumferential blood vessel seen at *H*. The vertebra shows a lower bone type than that seen in the frog. The ribs have the same alternating layers of bone substance and parallel blood vessels, and a vascular canal extending through the center and seen at *K*.

Figure 6. Longitudinal section of the urostyle. The bone articulates with the last vertebra and is 17 mm. long and 2 mm. wide, gradually tapering from the articulating surface to the distal extremity. *A* is the articulating surface having a layer of long, columnar cells with round nuclei in their attached extremities. The shaft of the bone is composed of alternating layers of bone substance and parallel blood vessels, which form angles with the external and internal surfaces, and is seen at *B*. A vascular canal extends through the center of the bone, as seen at *C*. The plan of structure is the plan of the fish.

Figures 7, 8, 9 show an interesting series of cross-sections of the femora. Figure 7 is a cross-section of the right femur at its midline. Figure 8 is a cross-section of the left femur of the same animal at the midline of the bone. The difference in shape and structure may be noted. The section of the right femur is round, of the left, triangular. Of thirty-nine cross-sections of as many right femora of amphibians that I have examined, 28 per cent were round, 26 per cent triangular, 41 per cent elliptical and 5 per cent irregular; that is, the most common shape was elliptical. In this particular animal, the right femur was one shape and the left another. Remarkable differences also are found in structure, as may be seen from the figures and descriptive text. In the right femur, a narrow ring of external circumferential lamellae surrounds the section as seen at *A*. A wide central ring of lamellae with numerous radiating and longitudinal vascular canals is seen at *B*. The radiating canals are seen at *E* and cross-sections of the longitudinal canals (which are really haversian canals) are seen at *C*. A narrow ring of internal circumferential lamellae surrounds the medullary canal, *D*.

By comparing the structure in Fig-

ure 7, with the structure in Figure 8, there is seen a remarkable difference, which is biologic in character. In Figure 7, there are both radiating and longitudinal vascular canals. In Figure 8, the radiating canals have all disappeared, while the longitudinal canals remain and thus establish the position of haversian systems in all later long bones. The bone type in both femora is a crude first. It is difficult to account for the variations in shape and structure upon the basis of function or environment. The two bones are on different levels of differentiation, Figure 8 representing a higher level than Figure 7, for the reason that it has more bone, which is the ultimate end of bone differentiation. In both of these sections may be seen the first differentiations of the haversian systems.

Figure 9. Cross-section of the right femur of another and different toad of the same species—*Bufo americana.* This section shows another and very important variation in the appearance of a single lamina, which occupies an irregular position in the wide central zone of the wall, as may be seen at *A*. Here, again, function does not account for the variation.

While this series does not appear to have any connection or relation to the teeth and may seem to be extraneous matter in the consideration of tooth development and especially in an animal which has no teeth, it shows a peculiar biologic disturbance in organic structures that may be important, as it gives a visible evidence that variations may and do occur and sooner or later establish new bone types regardless of function or environment. It is such variations that give character to species. Unaccountable variations may occur at some period of the history of life and become serviceable types in later developments; for example, the lamina, which made its appearance in Figure 9, and without any apparent reason, later becomes the most important and characteristic bone unit of structure of birds and the ungulates among mammals.

If, now, we consider the inorganic structures of the American toad—*Bufo americana*—in their comparative relations, along with those of the frog—*Rana catesbeiana*—we are confronted with a confusion of biologic evidences that are more or less contradictory in their apparent values. The toad is a vertebrate without teeth, the frog, a vertebrate with many teeth, and both are members of the same class. The toad has a mixed bone type prophetic of vertebrate advancement as it shows in outline the three bone units, lamella, lamina and haversian system. The prevailing bone type resembles that of the fish rather than that of the frog. The most important thing in biology is the start or introduction of a type. After this, function and environmental changes will utilize the type for the best interest of the individual. On the whole, therefore, the bone sections of the toad indicate a disturbance in biologic factors that is awaiting the selective action and adjustment of the class to which it belongs.

The bone of a toothless amphibian is a lower type of bone than that of a toothed amphibian; which may be a significant prophecy.

DIET AND DENTISTRY*

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IF IN this paper I seem to wander far from the announced subject, it is due not to accident but to design. More than twenty years of observation, study and experiment with the effect of diet on the teeth has left me with a supreme conviction—it is futile to regard an organ or set of organs as an entity pathologically or otherwise. The body is the entity. Within it, Nature's forces play and interplay irresistibly. We can help or we can hinder, but we cannot at a single spot check the sweep of these forces. We cannot detach the question, say, of oral health from the question of health as a whole. Fortunately, as dentists, we are past the stage where we regard the teeth as merely a handy mechanism for mastication, and treated them, accordingly, from the merely mechanical standpoint. We regard them now as a vital part of the body's economy, capable of causing far-reaching ills. Our next step is to consider seriously this economy as a whole. Without this step, we cannot hope for progress. "Perfect health," says Walt Whitman, "is simply the right relation of man himself and all his body, by which I mean all that he is, and all its laws and the play of them, to Nature and its laws and the play of them. When really achieved it dominates all that wealth, schooling, art, successful love, or ambition, or any other of life's coveted prizes, can possibly confer, and is in itself the sovereign and whole and sufficient good and the inlet and outlet of every good. In perfect health (a far, far different condition from what is generally supposed—indeed few minds seem to have the true and full conception of it)—sometimes I think it is the last flower and fruitage of civilization and art of the best education."

No man who knows the restlessness, the depression, the misery that may one or all accompany even a slight physical ailment will quarrel with this statement. Lack of harmony between parts of the body, abnormal development of an organ, failure of a part to function, the ravages of predatory germs—any one of these can make life a mockery. A "true and full conception" of perfect health may well hold our interest. Elsewhere, Whitman has made this clear; it has been taken up and simplified by his friend and pupil, Edward Carpenter, in his great philosophical essay "Civilization, Its Cause and Cure." You are doubtless familiar with the name Edward Carpenter; but, at the risk of digressing, I will remind you that he is the great Englishman, who after years of feeling his way through theology, the sciences, literature, the study of primitive and of so-called unprogressive peoples, has evolved probably the most distinctive of modern philosophies. It is

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often said that the work of the philosopher is one of unification, the work of the scientist, specialization. A man who possesses the qualities of both, like Edward Carpenter, should be able to throw light on the intricacies of the pattern woven into the fabric of life.

"The ancient idea of health," he writes, "seems to be a positive one—a condition of the body in which it is an entirety, a unity—a central force maintaining that condition; and disease being the break-up—or break-down—of that entirety into multiplicity.

"The peculiarity about our modern conception of Health is that it seems to be a purely negative one. So impressed are we by the myriad presence of disease—so numerous its dangers, so sudden and unforetellable its attacks—that we have come to look upon health as the mere absence of the same. . . . Health with us is a negative thing. It is a neutralization of opposing dangers. It is to be neither rheumatic nor gouty, consumptive nor bilious, to be untroubled by headache, backache, heartache or any of the 'thousand natural shocks that flesh is heir to.' These are the realities. Health is the mere negation of them. . . . According to the elder conception, and perhaps according to an elder experience, man to be really healthy must be a unit, an entirety—his more external and momentary self standing in some kind of filial relation to his more universal and incorruptible part—so that not only the remotest and outermost regions of the body, and all the assimilative secretive and other processes belonging thereto, but even the thoughts and passions of the mind itself, stand in direct and clear relationship to it, the final and absolute transparency of the mortal creature. . . . The great positive force of Health and the power which it has to *expel* disease from its neighborhood is a thing realized, I believe, by few persons. . . . In order to realize what health is, how splendid and glorious a possession, he (man) must go through all the long and negative experience of disease."

Again, our own philosopher, Emerson. "The first wealth," he writes in his essay on "Power," "is health. . . . Health is good—power, life, that resists disease, poison, and all enemies, and is conservative, as well as creative. . . . One comes to value this *plus* health when he sees that all difficulties vanish before it."

The quest for health is by no means a modern one. Since the dawn of civilization men have been seeking it, now in this field, now in that. Pythagoras, as a lad of nineteen, was testing out principles of living in 550 B. C. Contemporaneously, Buddha was seeking through abstinence the way to physical and spiritual well-being. Over a century later, Plato, an ardent disciple of Pythagoras, devoted himself to the study of life, which culminated in "The Republic." In his "Laws" he enunciates the doctrine that the springs of human conduct and moral worth depend principally on diet. Seneca, 300 years afterward, makes dietetics of the first importance; and so on down the ages. Thoreau, Ruskin, and Tolstoi stand out among the seekers of our day. It is platitudinous to state that our physical degeneration has been going on for centuries; but the extent of that degeneration is not so widely known. The *Manchester Guardian* for March 5, 1920, cites from a report by a national examining board for the army that out of every nine men examined only three were found really fit. Commenting on these appalling figures, a writer in the same issue says:

Let us interpret as favourably as we may the report on national male physique, based on the examinations by National Service Medical

Boards, there yet remains much cause for disquietude. Let us remember that the figures cover the period between November, 1917, and October, 1918—a period when the age for service was high and when the pick of adventurous youth had voluntarily joined the army; there yet remains the fact that out of 2½ millions of men examined only three in every nine could be called "fit." Of the remaining six, two were "definitely infirm," three were incapable of more than a moderate amount of physical exertion and in view of their age might almost be called "physical wrecks," one was a "chronic invalid." To look up a train ful of city dwellers hurrying to work is always to have matter for melancholy thought; and these statistical pictures of our state are confirmation of a condition which one had hoped was rather imagined than real. The debased physical condition of the operative class will cause many people to echo the words of the chairman of the Manchester Board, when he asks whether commercial supremacy is worth while if it leads to the production of "a race of seniles at 40."

American conditions, as revealed by the army boards, while not so seemingly hopeless, are quite bad enough.

When we realize the full import of the situation in England—an average of only one man in three capable of fulfilling the demands of society on him—we may well stand aghast. Our own situation is but little more encouraging. The whole present order—civilization itself—is threatened. Nothing is more certain than Plato's doctrine that states are as the men are. A state whose citizens cannot react efficiently to life is doomed. To us who know the number of unfortunates thrown from one cause or another on the public charge, it will not seem an exaggeration to forecast a day when the unfit will outnumber the fit. Such a society is unthinkable.

How can we best meet this challenge? Medicine has struggled bravely all these centuries, with the results we have just noted. Is it not possible we have been barking up the wrong tree? Carpenter again has a stirring message.

If we accept any theory (even remotely similar to that just indicated) to the effect that Health is a positive thing, and not a mere negation of disease, it becomes pretty clear that no mere investigation of the latter will enable us to find out what the former is, or bring us nearer to it. You might as well try to create the ebb and flow of the tides by an organized system of mops. . . . But the fact is that medical science does not contradict disease—any more than laws abolish crime. Medical science—and doubtless for very good reasons—makes a fetish of disease, and dances around it. It is (as a rule) only seen where disease is; it writes enormous tomes on disease; it induces disease in animals (and even men) for the purpose of studying it; it knows, to a marvelous extent, the symptoms of disease, its nature, its causes, its goings out and its comings in; its eyes are perpetually fixed on disease, till disease (for it) becomes the main fact of the world and the main object of its worship. . . As to the lodgment of disease, it is clear that this would take place easily in a disorganized system—just as a seditious adventure would easily effect a landing, and would find insubordinate materials ready at hand for his use, in a land where the central government was weak. And as to the treatment of a disease so introduced there are obviously two methods: one is to reinforce the central power till it is sufficiently strong of itself to eject the insubordinate elements and restore order; the other is to attack the malady from outside and if possible destroy it—(as by doses and decoctions)—independently of the inner vitality, and leaving that as it was before. The first method would seem the best, most durable and effective; but it is difficult and slow. It consists in the adoption of a healthy life, bodily and mental, and will be spoken of later on. The second may be characterized as the medical method, and is valuable, or rather I should be inclined to say, ***will*** be valuable, when it has found its place, which is to be *subsidiary* to the first. It is often, however, regarded as superior in importance, and in this way, though easy of application, has come perhaps to be productive of more harm than good. The disease may be broken down for the time being, but the roots of it not being destroyed it soon springs up again in the same or a new form, and the patient is as badly off as ever.

Here he points the way—"the adoption of a healthy life, bodily and mental." I need not tell you how far mod-

ern civilized man has departed from the ways of the natural man—who, however lacking in other respects, had at least a clear eye, a steady hand, a sound digestion, and unless brought to an untimely catastrophic end, the prospect of a consequently long and happy life. The question is, how are we, hemmed in by the civilization which has been at the same time our doing and undoing—how are we to get back? We cannot wipe out civilization; but we *can*, I am convinced, prevent it from wiping us out.

I have no hesitation in stating that the most necessary step is the return to a more primitive diet. Our dietetic crimes are heinous. We do not expect a steam engine to operate if fed on stones; but we expect our bodies, built to burn a nicely balanced diet of simple, rough food, to function on a conglomerate mixture of pork, doughnuts, soggy potatoes, and mince pie. "Rubner," writes Graham Lusk in his book, "Science and Nutrition," "regrets that the knowledge of biology, even among the educated classes, is so limited that the science of nutrition appears to them to be wholly useless." I have studied the matter of food in relation to health—and happiness—for more than twenty years. I am absolutely convinced that nothing else is so vitally important to society as a widespread knowledge and application of the gospel of proper food.

It has been my pleasure to test out various theories; and I believe none to be so generally applicable to our modern conditions as the simple program outlined by Plato nearly two thousand five hundred years ago. In the second book of the "Republic" he sketches a dietary program for the citizens of his ideal state: "They will feed on barley meal and flour of wheat, baking and kneading them, making noble cakes and loaves;—of course they must have a relish—salt olives, and cheese and they will boil roots and herbs such as country people prepare; for a dessert we shall give them figs, and peas, and beans; and they will roast myrtle berries and acorns at the fire.—And with such diet they may be expected to live in peace and health to a good old age, and bequeath a similar life to their children after them." Plato's program includes all the essential factors of a model diet based on the most advanced research of our day. There is an abundance of vitamins; the ration is excellently balanced; not too rich in proteins; there are no treacherous meats, no rich overcooked "made dishes" to undermine the digestive organs; there is the necessary roughage to enable these organs to function properly and naturally.

A detailed study of dietetics is outside the scope of this paper. I shall take up, however, briefly and untechnically, what I regard as the essential points.

1. *Vitamins.*—These elusive yet indispensable elements have been given such publicity that possibly they require no emphasis; yet their importance forbids their omission. A diet rich in fruits, vegetables, nonpasteurized milk and other dairy products, eggs, and the unmilled cereals will furnish the various types of vitamins abundantly. The extensive use of foods deficient in these mysterious elements holds out an invitation to disease.

The effects of fresh fruit and vegetable foods in cases of scurvy is familiar to all of us. Less well known has been their relation to growth. Dr. J. F. McClendon and Dr. J. P. Sedgwick, of the University of Minnesota, in a recent series of experiments on infants and young children fed on the dried extracts of oranges and spinach (both notably rich in vitamins) obtained results nothing short of astounding. For example, ten babies whose average gain per week had been 2.3 ounces, when fed on these

foods gained 5.7 ounces; eight babies were raised by feeding spinach from an average gain of 2.4 ounces to 10.9 ounces; a ten-months-old infant of normal weight, formerly gaining 8 ounces, gained in one week on spinach and fresh orange 23 ounces.

Vitamins are further known to have an important function in maintaining appetite. Dr. McClendon writes:

> In all animal experiments on a vitamine-deficient diet, loss of appetite occurs. With human beings, psychological factors may enter in so as to make it difficult to perform clean-cut experiments on this subject, yet the final loss in tissue substance in all deficiency diseases suggests that the appetite has been affected. We know that pure proteins, fats, and starches have no taste, but we do not know whether vitamines have flavor. We do know, however, that the taste of milk changes on boiling and the taste of many foods changes by canning and drying. Why is it that some persons have been known to defy the cholera germ for a raw oyster and the typhoid germ for a salad, and to give their lives for a momentary tickling of the palate? There must be some great advantage in fresh foods or else the desire for them would be eliminated by natural selection. To the clothes-moth the age of food seems to make little difference, but when a man sits down to a meal of storage eggs, canned milk, jerked beef, and hardtack it requires considerable hunger to whet the appetite. This craving for fresh food has probably saved more lives than are killed by germs.

2. *Source of Proteins.*—The average man relies largely for his protein supply on meats. As a factor in diet, meat has been for centuries, if you will forgive me, a bone of contention. Many have been the discussions from the ethical standpoint; more numerous still the arguments from the standpoint of health. This prejudice against meat, if prejudice it be, goes back to Old Testament days. "Be not among winebibbers, among riotous eaters of flesh," enjoins the great Solomon, and again, "The hay appeareth, and the tender grass showeth itself; and herbs of the mountain are gathered . . . and thou shalt have goats' milk enough for thy food, for the food of thy household." You recall the experiment of Daniel: "But Daniel purposed in his heart that he would not defile himself with the portion of the king's meat, nor with the wine which he drank." . . . "Then said Daniel, 'Prove thy servants, I beseech thee, ten days; and let them give us pulse to eat and water to drink.' . . . And at the end of ten days their countenances appeared fairer and fatter in flesh than all the children which did eat of the portion of the king's meat. Then Melzar took away the portion of their meat, and the wine that they should drink; and gave them pulse." Personally, I believe a meatless diet the more wholesome. Cheese, milk, eggs and nuts furnish the necessary kinds and amount of protein in forms, I think, more readily assimilated, than meat. There is no question that meat, in the quantities usually eaten, in time overworks the kidneys. It is highly putrefactive in the intestines and frequently remains so long there as to cause autointoxication. It contains the poisonous products of the animal which were on the way to excretion when the animal was killed; also toxins due to decomposition after killing. Epidemics of meat poisoning are recorded. Since it is often imperfectly cooked, animal diseases can be transmitted through meat to man. The more common are tuberculosis, glanders, anthrax, and dysentery. The danger of tapeworms and of trichiniasis from pork is well known. Naturally, the toxic nature of most meat places undue strain on the liver.

Another argument against meats is that the human dentition is clearly not carnivorous, nor even clearly omnivorous. Buttner, in his "Fleshless Diet," shows that our teeth are not primarily adapted to eating meat. Like the bear, we can if we must.

There is a current belief that vegetarians lack energy and endurance. Not

only has this been disproved, but it has also been shown that vegetarians have the advantage of meat-eaters in both respects. The Japanese live chiefly on vegetable food; yet there is probably no more vigorous race. Carpenter writes:

> Animal food often gives for the time being a lot of nervous energy—and may be useful for special purposes; but the energy is of a spasmodic feverish kind; the food has a tendency to inflame the subsidiary centres, and so to diminish the central control. Those who live mainly on animal food are specially liable to disease—and not only physically; for their minds also fall more easily a prey to desires and sorrows. In times therefore of grief or mental trouble of any kind, as well as in times of bodily sickness, immediate recourse should be had to the more elementary diet. The body under this diet endures work with less fatigue, is less susceptible to pain, and to cold; and heals its wounds with extraordinary celerity; all of which facts point in the same direction.

Again, Graham Lusk writes: "It is quite certain that meat in the quantity it is consumed today is entirely unnecessary and it is susceptible of scientific proof that mechanical work is more efficiently and economically derived from carbohydrate food than from meat."

3. *Balanced Ration.*—Akin to the sources of protein is the quantity that should be consumed. Most people still live by the Voight ideal of approximately 120 gm. of protein daily. This is, in my experience, much too high. For the past fifteen years, I have lived an active life on approximately from 40 to 50 gms. a day, and have been incomparably the better off for it. The entire feasibility of a low protein diet has been conclusively proved by Chittenden and others. About 10 to 15 per cent of protein, 25 per cent of fat, and 60 per cent of starch constitutes the ideal balanced ration. Dr. Harvey Wiley also advocates a lower protein percentage. We have already discussed the dangers of overeating proteins. Dr. Sims Wallace, in his book "Child Welfare," brings out forcefully the menace of a diet too rich in sugar. He quarrels with those of the medical profession who believe in the special efficacy of cane sugar as food, particularly for children. He contends that the carbohydrates found in cereals or vegetables more than fulfill our requirements as to kind and amount of such food without the deleterious effect of sweets on the teeth; and he advocates with, I must say, well-supported arguments practically a sugarless diet.

Caloric Requirements.—It is now rather generally admitted that most of us eat too much. An average of 35 calories daily to the kilogram body weight is a standard often cited for those leading a sedentary life. Thus, a person weighing 120 pounds, of sedentary habits, requires approximately 2,000 calories daily. This is at least one-fourth less than is usually thought necessary; many people eat twice as much as they should. There is a corollary to this reduced ration which will probably prove about equally popular—the omission of the noon meal. The two-meal-a-day standard (which let me say I have followed for more than ten years), though it appeals to the average listener as highly revolutionary, is by no means new. It was, and still is, the standard of the more primitive and natural living races, at the same time the strongest and longest lived. I might cite the Zulus and Maoris as typical. No races are physically more nearly perfect, none have greater strength and powers of endurance. Just why should this be true? There are several reasons. Given a definite caloric requirement for a day, is it possible to divide it into three or more meals and at the same time furnish bulk enough with each meal to insure healthy peristaltic action? I doubt it, and since our general health hinges on thorough elimination we cannot afford to take a

chance. Clinical experience of English and Scotch practitioners shows that a reduction in the number of meals is followed by beneficial results. (Rabagliati.)

When one eats but twice a day, one is hungry at mealtime. No cocktail, caviar sandwich, tabasco sauce or other stimulant is required to draw us to the table. Physiologic chemistry has shown that such so-called aids to digestion are merely whips to a tired horse, and uniformly injurious. There is a zest for food on the two-meal plan that makes eating the pleasure it should be. It is fulfilling Nature's just demands, not forcing on her a too heavy load.

This suggests a third advantage in two meals—the limitations of the stomach, if one chooses the kinds of food wisely, make overeating difficult rather than tempting. With three meals, it is almost impossible not to overstep the line of Nature's needs.

Obviously, this involves less mechanical wear and tear on the digestive system. If two loads per day, well-balanced and in every way sufficient, will maintain us, why wear out the system with 50 per cent more work?

In this hurry-up modern world, the time saved is a consideration. The hour or so at noon could be spent quite profitably on the breakfast snatched as we go, and in a few minutes of rest after dinner. It gives us time, too, for mastication, that almost antiquated process. Again, it is cheaper, and our wives will like it.

I will give an illustration of how it can be worked out. Table 1 presents a daily ration that is approximately what one man of 120 pounds has used for several months, with only two meals a day.

An illustration of ideal meals for an adult for twenty-four hours is given in Table 2.

TABLE 1.—DAILY RATION, TWO MEALS A DAY

Food	Amount	Calories
BREAKFAST		
Apple	One, large	75
Prunes	10 to 12 small	200
Cream	Quarter glass	100
Bread	2 slices	200
Butter	1-inch cube	50
Cheese	1-inch cube	100
Marmalade	Tablespoonful	100
Coffee, sugar and cream	One cup	100
Apple	One large	75
		1,000
SUPPER		
Apple	One, medium	40
2 eggs baked with cheese		270
Rice	Ordinary cereal dish	100
Carrots or other fresh vegetable	3 tablespoonfuls	150
Celery and radishes or green salad		
Bread	2 slices	200
Butter	1-inch cube	50
Walnuts	3 California	50
Dates	6 small	100
Apple	One, medium	40
		1,000
		2,000

Average hours of sedentary work	10
Average hours of exercise (walking)	3
Sleep	8

TABLE 2.—IDEAL MEALS FOR AN ADULT

BREAKFAST*

Food	Calories
Fruit with peeling, raw, equivalent to a large apple	50
Stewed fruit (200) and cream (100) ¼ glass	300
3 slices of bread, coarse	300
Butter, ordinary pat or ball	100
Cheese, 1½ cubic inch	100
Marmalade or jam	50
Coffee, tea, or hot water, with sugar (50) and cream (100)	150
Raw fruit	50
	1,100

*One glass of water one-half hour before breakfast, two to three hours afterwards, at noon, at three or four o'clock and one-half hour before supper.

SUPPER

Raw fruit	50
Soup, cream of celery	50
Meat or eggs	200
Rice or potatoes with peelings	200
Vegetables	200
Bread, rough	200
Butter	100
Salad, with oil and lemon	50
Fruit, raw	50
	1,100

TABLE 3.—ORDINARY DAY'S RATIONS*

	Food	Calories	Protein	Fat	Carbohydrate
2	oranges	100	6	3	91
14	stewed prunes	150	4.5	0	145.5
¼	glass cream	100	5	86	9
1½	square inch cheese	100	25	74	1
6	slices bread	600	54	42	504
2	eggs	160	51	109	0
2	pats butter	200	1	199	0
2	small lumps sugar	40	0	0	40
2	glasses grape juice	200	0	0	200
14	stewed apricots	200	16	0	184
1	ordinary helping of halibut	100	61	39	0
2	ordinary potatoes	100	11	1	88
1	small glass milk	100	19	52	29
1	inch cube of chocolate	50	6	44	0
		2,200	259.5	649	1,291.5
	Per cent		11.8	29.5	58.7

*For persons weighing 120 pounds, doing light work.

TABLE 4.—DISTRIBUTION OF RATION (TABLE 3)

Time	Food	Calories
5:00 a. m.	Water	
5:50 a. m.	Apple	100
6:00 a. m.	Stewed prunes (14)	200
	Cream	200
	Rye bread	200
	Butter	100
	Cheese	100
	Jam and sugar	100
	Raw fruit	50 to 100
		1,100

Time	Food	Calories
10:00 a. m.	Water	
1:00 p. m.	Water	
3:00 p. m.	Water	
5:00 p. m.	Water	
6:00 p. m.	Raw fruit	100
	Eggs	150
	Helping of rice	150
	Helping of vegetables	200
	Salad with oil and lemon	50
	Rye bread	200
	Butter	100
	Fruit and cream	100 to 200
		1,100
10:00 p. m.	Water	

Roughage.—Another common dietary fault is the failure to provide adequate roughage. We do not give the digestive tract the bulk necessary for stimulating peristaltic action. As a consequence, food stays in the body too long, and we suffer autointoxication. If, as a nation, we would abandon bread and other concoctions of overmilled flour for simple rough breads made of whole grains it would be a long step toward overcoming the national evil of constipation. I cannot forbear reading at this point a newspaper clipping entitled "Pancakes."

There is no anesthetic more potent than the pancake. After eating a stack of pancakes, a person is indifferent to almost anything.

The pancake is not taken in the arm, hypodermically, nor is it inhaled like ether, but it is a drug with a shape and a kick all its own. It is in disc form about the size and thickness of a graphophone record. The patient or pancake-ee may administer the dose himself—although he should be watched and dragged off before he completely suffocates himself. The process is more pleasant if the pancake is laved in maple or imitation maple molasses. As the patient eats the pancakes he develops a frenzy and will eat himself to death unless a whistle is blown or the supply is arbitrarily shut off. In ten minutes the patient will begin to yawn, in a half hour he will be completely bored with life, and in forty minutes he will fall into a stupor and you may sell him life insurance, take his pocketbook, or get his name on the dotted line for a building lot in a swamp. A man under the influence of pancakes will resist nothing. He has no interest in life except his sweet dreams!—Don Herold.

Rough breads, plenty of fruit—five times what we ordinarily eat—whenever possible, unpeeled, fresh salads and quantities of bulky vegetables will promote healthy activity of the intestines.

It is undoubtedly true that anything affecting the general health strikes at the

weakest link in the bodily chain. The teeth, because of generations of faulty feeding, offer a handy lodgment for infections. I need not enlarge on this to you. This discussion of diet, therefore, is all pertinent to our problem, as well as to that of health in general. In the British medical press we read: "It has been proved up to the hilt that nine-tenths of all dental disease is preventable. Of all peoples the British have the worst teeth, and the shocking prevalence of dental disease among them is due to faulty dietetic customs." There is a special phase of the subject, however, which concerns us especially—the immediate local effect on the teeth of perverted eating. Dr. Wallace discusses the question from both the general and the local standpoint. His chief point concerning the teeth as such is that "the food should be of such a nature or the meal so arranged that the mouth and teeth will be physiologically clean at the end of the meal." He advocates, as Pickerill has done, fresh fruit at the close of the meal in place of the customary sugary dessert. The toothbrush and an acid mouth wash attempt to do artificially what an apple does naturally. Artificial measures should be regarded as supplementary, not self-sufficient. Dr. Wallace goes into a lengthy analysis of the properties of mucus and saliva in their relation to dental hygiene. Space forbids my covering this; but I commend it to your attention as quite fundamental to an intelligent study of the subject.

The title of Dr. Wallace's book "Child Welfare" is suggestive. Youth is, of course, more adaptable, more capable of readjustment, than age or middle age. If we begin our reforms with the infant, we shall strike at the roots of the matter. Given proper food through infancy and a wholesome diet for the first fifteen years, a child is pretty well insured against caries, unless he backslides *wholly*. Dr. Wallace makes a valuable point in insisting that the infant after weaning be given, not the customary soft foods altogether, but food adapted mechanically to human dentition. I can by no means agree with him in the kinds of food, such as meats, fish, and puddings, selected; but I believe the principle is excellent.

First of all, it should be noted that theoretically milk should never be presented to infants; it is the mother's breast which should be presented to them. From this, of course, they naturally suck liquid milk; when the time comes for supplementing this with other articles of diet, theoretically, a solid piece of food which the infant can partly take into its mouth should be given to the child. Of course such food must be of such a nature that the child can gnaw it and suck nutriment from it, or by insalivating it can reduce it to a more or less liquid state. If a child has not been cheated into gulping down solid food by making it as like milk as possible, solid food of a physical consistency not resembling milk is arrested in the mouth, and retained there until by the action of the teeth or gums and tongue it has been reduced to a semi-liquid state. It is not my intention to repeat here the arguments or details with regard to this method of effecting the change from the liquid milk diet to the varied diet of childhood. Suffice it to say that bread and crust with butter, or preferably toasted bread and butter, may be given as the first solid article of diet, say about the age of nine months, provided it is *not* soaked in milk.

While I cannot concur in feeding young children meat, broths, fish, tea, coffee, and puddings, I believe the harm they might do is partly neutralized by the presence in his outlines of fresh fruit with every meal. It is astounding to me that in the most enlightened American research in infant-and child-feeding so little use is made of this invaluable food. In a bulletin, "Food for Your Children," issued by the United States Food Administration during the war[1] it is interesting to note that, in the six model meals presented, fresh fruit is not suggested once. In a newspaper gov-

1. United States Food Leaflet No. 7, Department of Agriculture.

ernment food bulletin for children from 5 to 7 years old, giving four meals for the day, fresh fruit is not mentioned. I should insist on it with every meal from the age of 9 months to 70 years.

I have intimated that I do not expect to see this dietetic program put immediately into general practice. You will agree with me that it amounts to a revolution; and people as a rule make revolutions a last resort. A body of scientific men, however, may listen to it open-mindedly; and I can assure you again that it has its rich rewards. To the nation, they would be incalculable. It has been well proved that the appallingly high infant death rate is due largely to the mothers' faulty diet and metabolism. To many an individual, it has already brought its meed of health and happiness. We have the quaint testimony of that vigorous old Italian, Luigi Cornaro. I quote from a biographical sketch by Howard Williams:

> Even in an age and in a city noted for luxuriousness and grossness of living of the rich and dominant classes, he had in his youth distinguished himself by his licentious habits in eating and drinking as well as by other excesses. His constitution had been so impaired, and he had brought upon himself so many disorders by this course of living, that existence became a burden to him. He informs us that from his thirty-fifth to his fortieth year he passed his nights and days in continuous suffering. Every sort of known remedy was exhausted before his new medical adviser, superior to the prejudices of his profession and of the public, had the courage and good sense to prescribe a total change of diet. At first Cornaro found his enforced régime almost intolerable, and, as he tells us, he occasionally relapsed.
>
> These relapses brought back his old sufferings, and, to save his life, he was driven at length to practice entire and uniform abstinence, the yolk of an egg often furnishing him the whole of his meal. In this way he assures us that he came to relish dry bread more than formerly he had enjoyed the most exquisite dishes of the ordinary table. At the end of the first year he found himself entirely freed from all his multiform maladies. In his eighty-third year he wrote and published his first exhortation to a radical change of diet under the title of "A Treatise on a Sober Life," in which he eloquently narrates his own case, and exhorts all who value health and immunity from physical or mental sufferings to follow his example. And his exordium, in which he takes occasion to denounce the waste and gluttony of the dinners of the rich, might be applied with little, or without any, modification of its language to the public and private tables of the present:
>
> "It is very certain," he continues, "that Custom, with time, becomes a second nature, forcing men to use that, whether good or bad, to which they have become habituated; and we see custom or habit get the better of reason in many things. . . . Though all are agreed that intemperance (la crapula) is the offspring of gluttony, and sober living of abstemiousness, the former nevertheless is considered a virtue and a mark of distinction, and the latter as dishonorable and the badge of avarice. Such mistaken notions are entirely owing to the power of Custom, established by our senses and irregular appetites. These have blinded and besotted men to such a degree that, leaving the paths of virtue, they have followed those of vice, which lead them imperceptibly to an old age burdened with strange and mortal diseases. . . .
>
> "Nothing more is requisite for this purpose than to live up to the simplicity dictated by Nature, which teaches us to be content with little, to pursue the practice of holy abstemiousness and divine reason, and accustom ourselves to eat no more than is absolutely necessary to support life; considering that what exceeds this is disease and death, and done merely to give the palate a satisfaction which, though but momentary, brings on the body a long and lasting train of disagreeable diseases, and at length kills it along with the soul. How many friends of mine—men of the finest understanding and most amiable disposition—have I seen carried off by this plague in the flower of their youth: who, were they now living, would be an ornament to the public, and whose company I should enjoy with as much pleasure as I am now deprived of it with concern."
>
> At the age of seventy a serious accident befell him, which to the vast majority of men so far advanced in life would probably have been fatal. His coach was overturned, and he was dragged a considerable distance along the road before the horses could be stopped. He was taken up insensible, covered with severe wounds and bruises and with an arm and leg dislocated, and altogether he was in so dangerous a state that his physician gave him only three days to live. As a matter of course they

prescribed bleeding and purging as the only proper and effectual remedies:—

"But I, on the contrary, who knew that the sober life I had led for many years past had so well united, harmonized, and dispersed my humours as not to leave it in their power to ferment to such a degree (as to induce the expected high fever), refused to be either bled or purged. I simply caused my leg and arm to be set, and suffered myself to be rubbed with some oils, which they said were proper on the occasion. Thus, without using any other kind of remedy, I recovered, as I thought I should, without feeling the least alteration in myself or any other bad effects from the accident, a thing which appeared no less than miraculous in the eyes of the physicians."

The power to resist disease, by the way, is not the least advantage gained from temperance. Cornaro lived to the ripe age of 102, in full vigor and in possession of his faculties.

"The least habit of dominion over the palate," writes Emerson, "has certain good effects not easily estimated . . . Let us learn to live coarsely." This is almost synonymous with to live correctly. Under modern conditions, it calls for intense application, for all we can glean from race-experience, for a continual readjustment of the whole self. Its reward is the most satisfying of all life's gifts—a perfect equipment, bodily and mental, for the battles of life.

It is obvious that if we as dentists are to lend ourselves constructively to the problems of human welfare—so much broader, so much more complex than any question merely of the teeth—we must have a broader interpretation of our calling. We must think of dentistry not as a distinct profession, but as a specialty in medicine. Dr. C. H. Mayo, in "The Control of Focal Infections," writes:

> Diseases of middle life are increasing. They are microbic, of a chronic, recurring character and are carried into the blood stream from a few foci, the mouth being the source of the greatest danger. A crowned tooth is not a crown of glory, and may cover a multitude of germs. Modern dentistry is relieving the world of much of its misery by watchful care of foci connected with the teeth, and the trend of modern medicine and dentistry is bringing their fields again closely together. Dentistry should be a department of medicine, as it is as closely associated with medicine as are the specialties of the eye, ear, nose and throat, etc.

Its separation from medicine in the first place was a crime. It is ours to make what amends we can—the way lies clear before us. We must ally ourselves with all the forces working for human good. We must defer, when necessary, to the greater end. The type of man who can do most for dental ills in the future may be not a dentist, but a philosopher, a leader, a humanitarian. We must escape Osler's criticism. "Specialism," he says, "now a necessity, has fragmented the specialists themselves in a way that makes the outlook hazardous. The workers lose all sense of proportion in a maze of minutiae . . . applying themselves early to research, young men get into backwaters far from the main stream." We need not only the skilled technician, such as we have hitherto evolved, but the finest type of doctor, who sees dentistry as but a phase of the great problem. We must have men who like Cabot's health officer will save not by tens but by the hundred thousand. Such men will be able to correlate, to unite; they will have the distinterestedness of the ancient Greeks, the vision of the highest type of modern physician. "Our student," writes Emerson, in his essay on culture, "must have a style and determination, and be a master in his own specialty. But, having this, he must put it behind him. He must have a catholicity, a power to see with a free and disengaged look every subject. . . . Let us make our education brave and preventive."

DIET, OUR BEST THERAPEUTIC ALLY

By JESSE V. BOSWELL, D.D.S., Springfield, Missouri

(Read before the American Dental Association, Louisville, Ky., September 22, 1925)

THE matter contained herein is not presented as the result of my own research, or as truth absolute, but is offered as a compilation and analysis of the fruits of the labors of others, for what they will avail us in our eternal march forward, and with the book open for revision whenever new evidence shall be presented. Whatever I may say as to the importance of proper diet, I am well aware of its limitations. To some of these attention will be given in order to show the difficulties, perhaps impossibilities even, in connection with our efforts to prevent or control dental and oral diseases.

Some years ago, Dr. Osler stated that he would unhesitatingly say that more human disease resulted from bad teeth than from the use of alcohol. Later, Dr. Mayo made the assertion that the next step in preventive medicine should come from the dental profession,—asking "will they take it?" This made us feel important even beyond the degree warranted, if we consider the facts pertaining to the status of our professional achievement, as far as preventive dentistry is concerned.

While it is true that as a profession, in a general way, we have made great advances in the means of restoration, the defective tooth is still where it was a century ago, a thing, though amenable to repair, not much protected from destroying influences. We still acknowledge that the chief means which we can command is the toothbrush, medicated pastes, powders and liquid washes, now known to be inefficient. That such agencies fail is apparent to him who finds that those who have need for extensive dental treatment are habitual users of these means of prophylaxis, while the smaller number of persons, possessing good teeth, may aknowledge their failure to observe home prophylaxis. Usually, about thirty-five years carries the regular patient from the first small fillings of early childhood on through the stages of larger fillings, crowns and late model bridgework, to the removal of foci, and insertion of the "new set" which he "would not exchange for his own teeth."

No one has appreciated more the value of prophylaxis, nor practiced it more faithfully, than I. I have recognized in the unclean mouth a condition to be deplored, dangerous in the extreme, and demanding the best local treatment known for its correction in the respects of cleanliness. But such treatment is only a part of the toilet, and while in a slight degree inhibitory, is not of much value as a preventive.

I believe it to be within the province and the power of the dental profession

to accomplish much more than was indicated by Dr. Mayo; for he had in mind the removal of foci of infection, which, after all, are too frequently but a result of failure of judgment or of skill. I refer to the possibility of prevention of the caries and pyorrhea which lead to the infected condition. This, I think, could be accomplished if the dentists and physicians could be led to see their opportunity for service, and to know the importance of correcting first causes, instead of treating effects.

How are we to prevent those conditions which arise in the oral cavity, and in turn lead to systemic diseases? It must be recognized that the destructive agencies within the mouth are but local manifestations of an improperly functioning organism, in which metabolism is disturbed, and the body's autoprotective and immunizing powers have been broken down.

That the oral conditions are indicative of disturbed life processes throughout the body, I have held from the earliest days of my practice, in 1901. In a paper presented before the Missouri State Dental Association, in July, 1906,[1] in speaking of pyorrhea, I said: "We must necessarily have a weakness; and herein we have the result of constitutional derangement. . . . . Plainly, then, there must be weakness in the parts, just the same as in the case producing caries of the teeth. It is universally accepted that the immediate causes of caries are distinctly local, yet who will deny the *influence of systemic derangements?*"

That was nineteen years ago, when we knew not, what we are but now learning, the causes of these disturbances of metabolism. Men like Sajous,[2] Falta[3] and others have been showing us the mechanism of the government of the body. Others, Funk, McCollum,[4] Howe,[5] Grieves, Marshall, the Mellanbys, McCarrison and many others, developing the newer knowledge of nutrition, through actual biologic experimentation, give us newer knowledge of life; and the evidence is becoming so strong and clear that he is not to be reasoned with who would deny it.

Man is an animal of complex nature, affected in many more ways than the brute; yet, so far as body is concerned, his is as that of the beast, requiring the same elements in his makeup, and returning to the same earth again.

In the body, there are about sixteen elements. The same sixteen elements are to be found in plants, and in a bucket of average soil. Now, in Nature each kingdom lives on the two others. We know less, perhaps, of the mineral kingdom than we do of the animal or the vegetable kingdom. We know of a certainty that the life of either plant or animal depends on food, and that the food must contain all elements necessary for growth and maintenance of the

1. Boswell, J. V.: Dent. Digest, April, 1907.

2. Sajous, C. E. de M.: The Internal Secretions and Principles of the Practice of Medicine, Ed. 9, Vols. 1 and 2, 1921; Endocrine Glands, and Dental Nutrition and Caries, Dent. Cosmos, 65 (July) 1923.

3. Falta, Wilhelm: Endocrine Diseases, 1923.

4. McCollum, E. V.: The Newer Knowledge of Nutrition, New York: The MacMillan Co., 1922. The American Home Diet. Frederick C. Matthews Co., 1920.

5. Howe, P. R.: Further Studies of the Effect of Diet on the Teeth and Bones, J.A.D.A., 10: 201 (March) 1923; Studies of Dental Disorders Following Experimental Feeding with Monkeys, J.A.D.A., 11: 1149 (Dec.) 1924.

plant or the animal. Although the requirements vary according to conditions surrounding each individual, general rules apply for the nourishment of all individuals, and too great a departure from a borderline can never be permitted.

I wish to reiterate that I do not hold that wrong diet alone is responsible for all defects and ills to which man is heir, nor that all defects and deficiences may immediately be corrected by the simple adoption of a more correct diet. So, before consideration of some of the principles of nutrition and proper diet, I wish to speak of some of the influences which limit or prevent corrections.

AGING

The first limitation comes from aging of the individual. It is possible, during the growth period, to train and change the body cells considerably, but with chance of success lessening as maturity, then old age, approaches. Each cell is an individual with a will, habits, likes and dislikes of its own. Each belongs to a group or colony having tastes, habits, etc., differing from those of other groups. That these habits, etc., may be changed through training is well known; but the training must be done and change be accomplished before age has produced that fixation which is the beginning of death.

EVOLUTION

The next limitation is that produced through the evolution of man and the change in his diet through which the teeth are becoming vestigial.

With respect to the teeth and jaws of man, it is evident that, in the first period, he was an herbivorous animal. There were then no mowing machines, nor even a reap hook; no grinders or food choppers, and no cook stoves; so it was necessary for him to tear, grind and chop, with his teeth, all that he ate. He ate raw food, for as yet the uses of fire had not been discovered. These operations required strong teeth, set in strong jaws, supported by strong alveolar processes. It is even probable that he had more than our four incisors, eight bicuspids and twelve molars.

Not only did he need those teeth for the purpose of seizing and chewing his food; they constituted a large part of his fighting armament. There were no knives, guns, etc., and he had not as yet learned the use of clubs or stones; so the teeth were the chief weapons.

As a result of civilization, individual fighting has been eliminated, food is ground to fineness and cooked to extreme softness, so there is no more need of teeth. Nature eliminates the useless, and the teeth are becoming fewer, as the many cases of missing lateral incisors, bicuspids and third molars attest. Sometimes, even second molars also are absent. Jaws, especially the mandible, become shorter and narrower, with alveolar processes thinner and weaker. Why so much weakening of these structures in this wise, if it is not because, having removed the need for teeth and jaws, we are losing the teeth and jaws?

But you say, "We do need teeth for mastication of our food;" for, "without mastication we cannot have digestion, without digestion we cannot have assimilation, without assimilation we cannot have nutrition, without nutrition there can be no life."

I affirm the foregoing theorem is unprovable, and, by ordinary observation, really an error. Take a hundred average men, and the food bolters will be

seen to be the active, live wire individuals, the healthiest and most efficient of the group. The weaker ones of the lot haven't sufficient energy to bolt.

Then see the brutes: the lion, tiger, wolf, etc., all bolters, having no trouble with digestion. But, you say, those are of the carnivora; and I answer: How about the omnivorous hog; though a bolter, found to be a powerful digester, and the herbivorous cow with her multiplication of stomaches and thorough masticating habits, found to be the opposite?

Then, again, observe the edentulous men, who regain health after loss of their natural teeth and "gum it" for the remaining forty years of their lives; Also, the many whose artificial dentures are so inefficient as to be equal to none. Many such plant flowers on the graves of their friends whose masticating efficiency was restored through wonderful bridgework.

I now hear you say that mastication is not for grinding or chopping the food, but to insalivate it, so as to start the sugar and starch digestion with the ptyalin. Here, again, it is easily shown that ptyalin digestion is not important. Innumerable people are kept alive and convalesce on rectal feeding. Medical works give many instances of the complete digestion of either of the three classes of foods, when introduced directly into the stomach. The history of Alexis St. Martin, a French Canadian, in whom a gunshot wound, on healing, left an opening of considerable size leading directly into the stomach, is referred to by many writers on physiology. This man lived for many years, able to digest all forms of food introduced directly, and without salivary admixture. Another case, reported in Flint's physiology, gives an account of the case of an English woman, who, on recovery after being gored by a bull, was found to have two openings in the abdomen leading into the intestines. She became emaciated as a result of starvation, because food taken into the mouth was expelled through the first opening; when fed through the lower opening she regained her health, and was the subject of extended observations.

REPORT OF CASE

A man, at present aged 33, married and with three healthy children, a street car motorman for the past ten years, and a farmer previously, through typhoid fever and complications suffered a closure of the esophagus when 15 years of age. Since that time, eighteen years ago, he has been compelled to feed himself, and even take his drinking water, directly into the stomach through a small hole permitting the introduction of nothing larger than a No. 16 catheter. His semiliquid food consists of milk, raw eggs, vegetable purees, soups, broths, thin custards, fruit juices, etc., or any variety of foods which can be so prepared as to admit of introduction. He mixes proteins, mixes starches, mixes proteins with starches, and has no fear of results of any mixtures, for his digestion is excellent, notwithstanding no saliva reaches his food. His general health is better than that of his associates, and he is able to stand hot weather better. His dental condition is about the average.

Because of these and other proofs, I submit that the amylopsin of the pancreatic juice is able to take care in full of all starch digestion; that the salivary ferment, ptyalin, is not important; and I conclude that the true functions of the teeth have been eliminated by processes attending civilization.

INHERITANCE

Another limitation or handicap which is presented comes through inheritance. Diseases or accidental defects of conformation are not transmittable. Tuberculosis, pneumonia, etc., are not passed to progeny through biologic transmission, but types of tissue cells having susceptibility, and governing mechanisms permitting poor metabolism are transmitted. A broken wing or leg in a parent fowl cannot be inherited; but split wing, wry tail, crooked back or breast, or curved toes readily become family characteristics, and, once in the line, are difficult to eliminate.

Seemingly, in the laws of inheritance, the things which we hold desirable we find most difficult of achievement, while many things viewed as objectionable seem to be dominant. It is difficult to breed into a family of hens the power to assimilate and utilize calcium for the production of the shells of the larger number of eggs which they could supply with the other minerals and fats, carbohydrates and proteins; and thus their egg production may be below expectations.

It is also difficult to breed into a family of cows the power to assimilate calcium and phosphorus and, without waste, put the surplus above that needed for body maintenance into a good heavy milk. These things being true, it is easy to see how it may be difficult to breed into a family of humans the power to metabolize calcium and phosphorus and fix those minerals in the bones and teeth; and to eliminate the tendency to waste the minerals.

It may be asked, Why do not all children of the family have similar dental conditions, since all are of same parentage? This is answerable with the mendelian law of inheritance, which is just as certain in its action with human beings as with animals and plants. One child may carry the chromosomes with genes of certain strong features from one line; while in another child, the genes of another line, producing weaker characters, are dominant.

Compare the quick growing and easily fattened pure-bred Missouri corn belt hog, with its slow growing, razorback, mongrel cousin of some hill section, the tendencies with each being matters of inheritance through breeding. While the laws of inheritance are but little known, what *is* known is of great value to breeders. Here is a simple illustration: Mate a black male fowl with a white female, and all progeny will be black because of the dominance there of black. Mate two of these black fowls, and one-fourth of their progeny will be white, the remaining three-fourths being black. Then, mating the white fowls of this second hybrid generation will produce all white offspring; mating a certain one-third of the black fowls of this second hybrid generation will produce all black fowls; but mating the other two-thirds of the black fowls of the second hybrid generation will bring forth both blacks and whites in proportion of three blacks to one white. Thus we see how white chickens may come from black parents and how one may differ from his parents and from brothers and sisters. These differences are noticeable even in cases of multiple births, such as in litters of pigs, puppies or kittens; also in the vegetable world, as in peas or beans in pods.

Perhaps, then, one person may have good teeth and another poor teeth, although both may have almost exactly the same dietary and other habits, because of the influence of heredity.

ENDOCRINES

Formerly, it was believed that all body action depended on the nerve system, the blood system, the lungs, alimentary tract, urinary system, etc., the workings of which could be more readily seen.

Now, observations relative to growth and maintenance clearly indicate that behind these, even, life depends on a proper functioning of certain other organs, having internal secretions and called endocrines. These glands, through their secretions, activate, stimulate, sustain and govern all processes of growth, maintenance and reproduction, including even the mind, and do so through a sort of warring balance. They govern the degree of mental efficiency, stature, conformation of the body, disposition and metabolism, and perhaps fix the age at which one dies.

Sometimes, the glands are not in normal balance at birth, and, again, though normal at birth, lose their balance later.

I haven't time to discuss at length, nor ability to more than touch high spots of this subject; but I wish to point out three things: the actuality of life processes created by the endocrines; their service in producing autoprotective resources, and the influence of the glands on calcium metabolism affecting the bones and teeth.

Evidence that certain of the glands are necessary for life is found in the fact that, on removal of either pituitary or suprarenals, death ensues. The fact that the autoprotective powers exist through the functioning of certain of the glands is proved when, after certain diseases or partial removal have effected either the pituitary or thyroid, the body maintenance and resistance grow less, and may be entirely destroyed. And as to calcium metabolism, the increase of skeletal growth following castration and spaying, or climatic or other conditions which cause late maturity or the opposite effect, or dwarfing when early maturity is promoted, is a matter of common observation.

The suprarenals are the true life glands, their secretion being the oxidizing agent of the blood; the respiratory principle of both the lungs and body tissues; the activating principle of the heart; and the stimulator of the thyroid mechanism, which, in its turn, sustains the pituitary. The latter is the nerve center of the group. The thyroid regulates the metabolism of the body through its iodinized secretion by labilizing the phosphorus of the cell and tissue waste. It has power through its opsonin to sensitize bacteria so that they may be seized by the phagocytes, and destroyed by digestive enzymes. The pituitary, a nerve center, is the governor of all nerve action, whether of the cerebrospinal or the sympathetic, influencing even the mind, as is observed in the case of imbecility, idiocy, etc. It is a test organ of the blood, producing its stimuli according to the needs of the body for metabolic or immunizing substances. These three: suprarenal, thyroid and pituitary, constitute a triumvirate by which the other internal secretors are subsidized and on which they are dependent.

Without the suprarenal secretion, oxidation, which is life, would not be possible. This secretion, epinephrin,

passes from the medulla into the inferior vena cava, where it mixes with the blood plasma. Later, on reaching the lungs, it absorbs the oxygen, becoming a high tension oxygenized substance, adrenoxidase (Sajous), in which the red blood corpuscles bathe, and which, through hemoglobin, they absorb and then carry to the tissues. Without this epinephrin in the blood, the amount of oxygen absorbed could not be more than that ordinarily in the air. That epinephrin is necessary in pulmonary respiration is evident also from the fact that it is found in relatively large quantities in the skin of toads, which is a part of their respiratory apparatus.

As a part of the thyroid mechanism, we have in close association the parathyroids, four in number, which seem to have considerable to do with tooth formation. In this connection, we have also the thymus, which secretes bodies containing 4 per cent phosporus, to be used for bone formation. The thymus gland is at its full growth and activity at about 2 years of age and atrophies by maturity, after which its work is carried on mainly by the thyroid.

It is admitted that the stresses of civilization, business, family cares, etc., affect the emotions of mankind; and with other things, such as confinement and lack of physical activity, tend to break down efficiency and vital resistance, and are factors to consider.

The six best doctors you'll agree, and no one can deny it,
Are sunshine, water, rest and air, exercise and diet.

DIET

Now, knowing that next to heredity, the most important of all things composing environment for an animal must be its food, we come to study food values. Formerly, chemical anaylsis and physiologic changes were the bases upon which that study was founded; but now we treat the subject in the light of biologic production or results. For instance, years ago, certain stock breeders believed yellow corn had greater feeding value than white corn, yet chemical analysis showed them to be similar. Today we know the superiority of yellow corn, and, in part, know the reason why it is superior. We also know that foods have life-giving principles which may be lost or destroyed, and that the more nearly in its natural living form food is taken, the more of the life-giving principles it may furnish.

Sajous, in his search for the identity of vitamin C, found response to what he termed the epinephrin-hydrogen dioxid test, through the tyrosin of vegetables, indicating a correspondence of this plant blood substance with the epinephrin of animal blood. Heating, in the process of cooking, so affects this vegetable substance that the test fails, just as vitamin C seems to be destroyed by cooking or other oxydation.

SUBSTANCES NECESSARY FOR GROWTH AND MAINTENANCE

Taking up, then, the substances necessary for growth and maintenance, we find, first, that the body is composed of sixteen elements, and that vegetation is made up of the same sixteen elements and a quantity of average soil of the earth contains the same sixteen elements. Twelve of these are mineral. Some of these elements are needed for body building, and some are used in metabolic processes. In case sufficient of the minerals are not supplied for the metabolic processes, none can be built up into

the body structures, and some already deposited may have to be withdrawn therefrom; for it has been learned, through fasting and starvation, that excretion of the minerals takes place just as in normal nourishment, and sometimes it is even greater. Some of these minerals are in minute quantities, and perhaps have little or no value. Others are so important as to be absolutely necessary for health and life. The minerals are widely distributed in Nature, in the materials used for food. Unfortunately, the commercialization of foodstuffs results in the removal of much mineral matter. The methods of cooking cause a greater loss, owing to the fact that the minerals are found in the form of soluble salts so easily thrown down and cast out with waste waters and juices, and also there is much loss through the casting aside of the leaves and peelings of root vegetables and fruits, and the outer coats of grains.

This is especially true of calcium, which, according to all authorities, is becoming almost absent from the modern dietary, from the dental standpoint a disaster, because it is so necessary in bone and tooth formation. McCollum has shown that limitation of calcium produces a hemorrhagic condition of the bones, and such softening of the bones as to make it impossible to dissect them without breaking. Howe is making experiments on monkeys with calcium deficient diets.[2]

It is obvious that the prerequisite in the production of good teeth is that the materials be supplied. The best source of calcium is milk, with leaves of plants a good second. Since the minerals are utilized in much the same form as taken, milk forms our best calcium supply, for it holds calcium and phosphorus in combination as acid calcium phosphate, a readily assimilable form. Such leaves as beet tops, turnip tops, spinach, kale and mustard, contain much calcium, and most fruits contain available calcium.

Now, if the calcifying of the deciduous teeth commences at the fourth or fifth month of fetal life, and the calcifying of the permanent teeth begins at the eighth or ninth month, and this is to continue not only through pregnancy and the nursing period, but even years after, and the mother is not obtaining or metabolizing enough calcium for her individual needs, how can she maintain her own mineral structures, and build for her child its bones and teeth, which, aside from inherited tendencies, do not come from under the influences of the gestation and nursing periods for several years after birth? This cannot be done on a diet of bolted white and corn flour, peeled and boiled potatoes, gravies, corn syrup, muscle meats, coffee, etc. It cannot be done.

Given the sufficient amount of calcium, phosphorus and other mineral elements which may be required, there yet remains a need for some very vital factors, to make the fixation of the materials certain, and these seem to compose a chain of which the breaking of any link may cause failure.

PROTEIN

One of these links lies in the quality of protein used. It has been found impossible to nourish properly laboratory animals of the carnivora or of the omnivora, on vegetable protein. Through the experiments of McCollum on rats, experimentation at the Missouri State Poultry Experiment Station in work with chickens, and other experiments,

this has been found true. It has likewise been observed on our farms, in the feeding of pigs and chickens. At present, our federal government through the Department of Poultry Husbandry is trying to effect the substitution of soy bean protein for that of meat, blood meal and milk, in the feeding of chickens; but, as yet, this has not been accomplished.

Proteins are built of eighteen or twenty amino-acids, but some have not suitable combinations or proportions. For growth, it is essential that there be a sufficient amount of amino-acid lysin; and for maintenance, enough tryptophan. These are best supplied to the carnivora and omnivora through animal proteins, such as meat, blood, milk or eggs.

BULK

Next in the chain hangs the bulk link. It cannot be denied that the primitive, natural man ate large quantities of food, and that his food was of a bulkier nature so that the combination of quantity and coarseness meant filled and self-cleaned intestines. Dr. Howe shows us in his experiments that when monkeys were fed a diet of refined products, the intestines were semi-atrophied, had shortened villi, and were lined with slimy, mucoid material. The feeding of filter paper for roughage or bulk was sufficient to correct this, cleaning the intestines and permitting the osmosis of better products instead of toxic wastes. Another similar experiment may be quoted. At the University of Wisconsin, Prof. J. G. Halpin,[6] fed a group of chickens a diet perfected to contain all food elements when chemically analyzed, but lacking bulk, and the chicks failed to grow, became sick and died in a short time. Of three other groups having exactly the same ration, except in the case of one the addition of 10 per cent of dirt, for another 20 per cent of charcoal and for the third 10 per cent of ground paper, all grew and thrived normally.

These and many like results demonstrate the need of bulk, which is being eliminated from modern human diet, and the simple means of restoration would be to consume more of the leafy vegetables, whole grain breads, peelings of fruits, etc.

VITAMINS

The next link to which I call attention is a very important one, and it is strange that scientific investigation has not earlier revealed to us that food has life which may be carried forward and continued from one organism to another. A breast fed infant gets something from its mother—something which no artificially fed child ever receives. A hen going into the nest to lay adds new life to the eggs previously laid, creating hatchability of the eggs and vitality of the chicks, which gathered eggs and the chicks hatched from them do not have.

Though conducting a full-time dental practice, I, for a hobby the past sixteen years, have lived on and operated a farm, where I have had opportunity to study Nature in many phases and at first-hand. We have observed that our horses, cattle and other stock are in best condition when, in the springtime, the growing live food is at its best. Digestion is better, eyes are brighter, hair coats sleeker, gestation better. The milk flow and egg production climb

6. Halpin, J. G., et al.: The Relation of Light to the Growth of the Chicken, J. Biol. Chem., 58: 33 (Nov.) 1923.

upward, and the nourishing properties of these two prime foods are greater. Conditions are different when grasses and other vegetables mature. Later, when we carry the stock through the winter, feeding the same substances, except that the foods are cured and the only change apparent is the loss of some water, it is difficult to maintain the animals in good condition.

Certainly, there has been some greater loss, evidently a loss of life, and I believe that just as, biologically speaking, progeny are parts actually of the parents, without break in life, so, also a living food may carry its life on into another organism, and that while many food substances may be utilized in what we may view as a dead state, some must be taken alive.

What, then, *is* life?

Edison says that he believes life to be a force which enters into such organizations of matter as are cooperating suitably and when coordination ceases, life departs. In the absence of a better, this seems a good definition. This may also explain vitaminic activity, which, we learn, is lost through breaking up of chemical organization though nothing of material nature may have been removed.

Knowledge recently gained would indicate that as far as our planet is directly concerned, the sun of our system, if not the dispenser of life, is the producer of growth and maintainer of life.[7] Blot out the sun, and in a little while life would cease. In studying the vitamins, then, it is interesting to note not only their distribution, effects and values, but also their relationship to sunlight.

In the case of vitamin B, the first one discovered, which is antineuritic, it has been found that some substances deficient in this factor may be made efficient through exposure to sunlight; and substances which may have lost their original efficiency may have it restored by exposure to the sunlight.

As to vitamin A, the growth-promoting factor, it is known to be more efficient when coming from organs or products of animals that have fed on green vegetation, either directly or indirectly. For example, that found in butter fat, egg yolk and liver fat. The greenness of plants, indicates a stored sunlight by virtue of the chlorophyl.

Vitamin C, the antiscorbutic vitamin, is best derived from oranges and other citrus fruits, plums, tomatoes. It is found in most fresh fruits and vegetables, including leaves of plants, all these having been dependent in their development on sunlight. It may also be had from raw meat, as explorers attest.

Vitamin D, which is antirachitic, found more abundantly in cod liver oil and egg yolk, and present in some other substances, has an action identical with that of sunlight, and hence would be considered as having stored radiant energy. A photographic plate may be affected by the rays from cod liver oil. Through the experiments of C. W. Carrick, of Purdue University, we learn that the oil, when placed in pyrex glass bottles and set in the feed troughs where the chicks might press close, having its glow fall on their bodies and on their food, is as effective as when fed internally, and prevents leg weakness, or rickets. These experiments of Pro-

7. Platt, F. L.: Independent of Weather and Seasons. A Study of Radiant Energy, Am. Poultry J., June, 1925.

fessor Carrick, if brought to successful conclusion, will perhaps mark an epoch in the care of young animals, including human babies.

Vitamin E has been reported discovered, but seemingly the evidence is not yet convincing. This vitamin, it is asserted, is responsible for fertility in animals.

In our study of dietary deficiencies in their relation to dental deficiencies, while we must give attention to all of the vitamins, believing that the absence of one may disturb the mechanism, we are especially interested in C and D, the first because of its relation to the blood stream and oxidation, and therefore a real life principle, and the second because of its influence on calcium metabolism, its power to balance or stabilize the calcium and phosphorus and fix them in the bones and teeth.

I know, through personal experience and the experience of others, the value of the antiscorbutic vitamin, furnished through the use of uncooked fruits and vegetables, as an ally in the treatment of pyorrhea, trench mouth, gingivitis and the like. I also know the value of the antirachitic element accompanying a proper supply of minerals for promoting good teeth, obtained through the use of milk and green food, having brought up a daughter, now aged 20, without an unsound tooth, and with prophylactic treatment thus far unnecessary.

All living things must be fed; so if the endocrines govern the metabolism, and these organs can be fed directly on gland substances or gland extracts, from sheep, heifers, etc., which originally were created in the bodies of these animals, through alimentation, should it not be possible to maintain normal condition of the endocrines, or correct it when abnormal though not defective, by alimentary feeding?

This is what we seem to be doing when we feed living (vitamin containing) foods.

The thyroid, through its iodin, producing a hormone, which promotes growth and provides for maintenance and immunization, needs animo-acids, lysin and tryptophan, and vitamins A and C. The pituitary body promotes growth of mineral centers, such as the skeleton and teeth, for which it needs vitamins C and D, and, as heat center, immunizing center and general nerve center, needs vitamins B and C. The suprarenals, being oxidizers, require C vitamin.

FOODS

What foods are required?

First: The leaves of plants, which possibly constituted the larger part of man's food at the first, with seeds and fruits auxiliary. Today, we have on the earth many people who use a large amount of leaf foods. These afford wide variety and a wholesome diet. Some should be eaten raw.

Second: A limited amount of meat, which supplies proper protein, though animal products, milk and eggs may take its place. The meat used in the diet should not be limited to muscle tissue but should include liver, sweetbreads, kidney and brain tissue. Raw liver is a delectable dish for Eskimos, Hawaiians, and other primitive and semiprimitive people.

Egg yolk, although valuable as a source of vitamin A, contains protein of good value, also fat, starch and minerals; which makes it a complete food, lacking only in bulky matter. It furnishes vitamin D in a sufficiency except for the decidedly deficient child, and, as

Fones,[8] has said: "The Creator did not intend us to be dependent upon the codfish for the raising of healthy children with sound teeth."

The seeds of plants, and the roots and tubers found in the markets, are all good foods for supplying certain elements, principally carbohydrates, but must be supplemented by other substances.

Milk is man's best food. It has been said that milk is food for babies but not for adults, because in Nature animals are weaned after a certain period and the teeth have grown. Yet, we know, from personal use, from observation and from study, that we cannot find food for chickens the equal of milk, although the chicken by nature is not a milk giving nor milk using animal. We also know that the people of those sections of the world where milk is a valued article of food are strong, active and long lived.

Just when milk from brute animals was first used as food for humans, we have no knowledge; yet, finding that the ancient Egyptians and people of India as well as of China deified the cow, we know it was a long time ago. Milk contains most of the food elements, including protein, of the best quality, fine fat and carbohydrate. It is rich in minerals, the best source of calcium and phosphorus. These minerals are found in a combination of acid calcium phosphate, and are easily utilized in the body. Milk is also rich in vitamins, if the animal producing it has been properly fed.

In addition to all of these factors, milk contains acid forming bacteria, which tend to prevent putrefaction in the intestines. Altogether, there is no substitute for milk.

McCollum, recognized as an authority on nutrition, lays down three rules, which it is wise to follow. These involve no intricate calory tables, no confusing directions, no fear-creating warnings, but simply the suggestion that each member of the family shall have daily:

First: A quart of milk, plain or in various forms, such as plain milk, cheese, cottage cheese, custards, creamed vegetables, cocoa, milk toast, ice cream, junket, etc.

Second: Two salads, serving fruits and vegetables which can be used raw.

Third: A liberal helping of cooked green leafy vegetable, such as spinach, kale, beet tops, turnip tops and wild greens.

"When these rules have been complied with," he says, "the appetite may, with reasonable safety, be permitted to dictate the rest of the menu."

McCollum calls milk, fresh fruits and leafy vegetables protective foods; so, since the "great triumvirate"—thyroid gland, pituitary body, and suprarenals—constitute the protective mechanism of the body, both anabolic and immunizing, they must have need of these foods suggested.

As to the use of sugar, I would say but little. There can be no doubt that sugar will produce a viscid saliva, which certainly aids in the production of a favorable condition for bacterial growth, etc. A child who is susceptible, descended from susceptible parents, should not be permitted to have candy, cookies, preserves or other highly sugared foods. The evil results from the eating of candy and other sweets come largely from the destruction of the nat-

8. Fones, A. C.: Diet in Relation to Teeth, Dent. Cosmos, 65: 519 (May) 1923.

ural sense of hunger for proper food which would supply building substances. The sugar consumed furnishes energy only. I believe that relatively immune persons whose appetite for milk, greens, etc., has never been lost, can partake of considerable amounts of sugar without hurt.

Given a body not unchangeably defective at birth, hereditarily or congenitally, we can, by correct feeding, so influence the trio of organs, the pituitary, as governing the nerve center; the thyroid as the metabolizer, and the suprarenals as life fluid secretors, that it will be possible to maintain a sound healthy body, with good bones and teeth.

DISCUSSION

H. F. Hoffman, Denver, Colo.: Dr. Boswell's paper covers too large a field and touches too many vital factors to be digested in one reading. I want especially to emphasize what he says about the opportunity for service which the dental profession has in preventing caries and pyorrhea, instead of devoting all our energies to "treating effects." If dentistry is to become anything more than a highly specialized reparative art, it must come through our ability, not simply to locate and remove the foci of infection, but to prevent their development. The medical profession owes most of its present standing in the public mind, not to accomplishments in the cure of disease, nor to the perfection of surgical technic, but to achievements in the control of epidemic diseases. This preventive work has made the world habitable and, after all, has received the conscious and subconscious recognition which it deserves. Therefore, acknowledgement of the value of dentistry to mankind will be only in proportion to our accomplishments in the field of prevention. As limiting or preventing the correction of disorders by diet, the author refers to aging, evolution, inheritance and activity of the endocrines, a refreshing and suggestive consideration. It is manifestly impossible, after the developmental period is past, to restore to normal condition and activity body cells that have become diseased through a lifetime of bad living. Dr. Boswell concludes that evolution is a limiting factor under which the teeth of man are bound to degenerate and to become vestigial; that their functions have been eliminated by processes attending civilization; that mastication is no longer necessary, and that the salivary ferment, ptyalin, is no longer necessary as a result of evolutionary changes in the metabolic economy of man. I believe that if this ever becomes a fact as a result of evolution, the ptyalin will no longer be a constituent of the saliva. The cases recorded as apparently functioning normally without the admixture of ptyalin are too few in number to form a basis for such definite conclusions as are reached by Dr. Boswell. Practically all the cases reported of persons living without the admixture of ptyalin with the food have been of adults. Presumably, in every case, considerable care has been exercised in the matter of the diet. It cannot be argued that any break in the chain of digestion is normal; and if it cannot be proved that these individuals have attained their maximum or ideal development, the claim that ptyalin is not needed remains unproven. Again, even if mastication and insalivation is not necessary to digestion, it is certainly necessary for proper growth, development and the maintenance of healthy conditions in the mouth. As far as the need for mastication is concerned, comparisons made with various animals having different digestive apparatus from that of man are irrevelant and prove nothing. The claim that the consistent food bolters will be found to be the active, live-wire individuals is based upon wrong premises and therefore misleading. The food bolter is usually an aggressive individual and gets by in spite of his habits, not because he does not masticate his food. He mixes a lot of saliva with his food, first and last, because he swallows most of it, thereby mixing it with his food through no effort of his own. We must admit that the digestive fluids mix with and act on the food more readily in proportion to the fineness to which the food is reduced. Most of the so-called live-wire feeders are also large eaters, which tends to aid elimination, the one factor of equal importance with nutrition, and we know that all the food should not be assimilable. But a prolonged observation of "peppy" persons shows that most of them break a wire or blow a fuse just when they should be in their prime not because they are food bolters, or hearty eaters, but usually because, having consumed too much

concentrated food, carbohydrates and proteins, they fall victims to arterial and kidney diseases. The slow masticator concentrating on mastication and how much taste he can get out of one mouthful usually restricts himself to concentrated food and satisfies his appetite without sufficient bulk to injure proper elimination. Neither type should be cited as the ideal. There are many factors working together to cause the present condition and general disappearance of the teeth of man. It is the common belief, which I think is erroneous, to regard this as the inevitable result of evolution, but is it not the result of lack of use and proper food? We have no grounds for thinking that the body cells can be so trained or changed as to make it possible to eliminate any or add to the sixteen elements now required; hence, the body cells can never by any process of training or evolution adapt themselves to a diet which has been robbed of any of the required elements. The cells may adapt themselves to changes of environment or function, but all elements required must be supplied; otherwise extinction, not adaptation, will result. If this is true, then those changes in the teeth of man occurring as a result of the deficiency of tooth building elements in the diet, point to the gradual extinction of the species instead of, as commonly supposed, the adaptation of man to an artificial diet. The paragraph on endocrines and the linking of the endocrines and vitamins is exceedingly interesting and offers food for careful study and thought. I believe that the endocrinologist will ultimately be a dietitian; that faulty endocrine secretion will be treated as an effect rather than a cause, and that careful case histories will include a record of what the patient, his parents and grandparents ate, and the dietary record of the patient will be as carefully kept as is the record of weights, measurements and the administration of gland extracts. Speaking of the life-giving principles of foods, Dr. Boswell says, "We know that foods have life giving principles and that the more nearly in its natural living form a food is taken, the more life it may furnish," and again under the subject of vitamins, speaking of the loss of life giving properties through the maturing of vegetation, while no material loss can be determined, he says, "Certainly there has been some greater loss, evidently a loss of life, and I believe that just as, biologically speaking, progeny are parts actually of the parents without break in life, so also a living food may carry its life on into another organism, and that while many foods may be utilized in what we may view as the dead stage, some must be taken alive." This may constitute the crux of our food problem. I have recently seen a practical demonstration of this idea. A considerable territory close to Denver has experienced an absolute drought of approximately fourteen months and practically covering two growing seasons in that locality. The milk stock in that region lost weight, their coats became rough, the production of milk practically ceased, pregnancy became almost nil, and most of the young were born dead. During this time, much of the stock was well fed on good hay and grain, but no silage. Even greater emphasis might be placed on bulk in its relation to elimination and to the fact that elimination is of equal importance with nutrition: also the body requirements for water. In Colorado, we have a health conference group, representing the following six organizations: Colorado Child Welfare Bureau, Colorado University, Bureau of Community Organization, Colorado State Psychopathic Hospital, Colorado Tuberculosis Association, Colorado State Board of Health, and Colorado State Dental Association. A group of representatives from each of these organizations visits different sections of the state, giving to infants and children of preschool age a complete physical examination, including an examination of the teeth, and with this examination careful advice and instruction is given to the parents. No child is examined without the parent being present. Complete records, including dietary records, have been kept. The localities where the conferences have been held represent great variety as to climate, altitude, occupation, prosperity, nationality and education. Each individual community seems to have dietary habits of its own, and all kinds of food habits are encountered. The different communities show different proportions of tooth troubles from the nearly destroyed denture to the perfect. In general, the teeth appear to be influenced only by the diet. A close relation exists between malnutrition, and disease of the tonsils, adenoids and teeth. The statistics for these conditions almost coincide. The evidence all proves that diet is our best therapeutic ally.

Morton J. Loeb, New Haven, Conn.: It has been my thought for many years that metabolism is the basis of all tooth ailments, and

I feel that is one of the most important thoughts underlying Dr. Boswell's paper. Just what is metabolism? Aristotle described life as the "assemblage of operations of nutrition, growth and destruction." The operations are complex chemical activities, which reduce the foodstuffs to simpler and simpler conditions, until their energy content is nearly or entirely exhausted and then eliminated as excretions. Of course, the waste must be counterbalanced, and this dual process is metabolism. And this is life. If we bear in mind that the food we take must undergo several changes and the mechanism producing these changes may be defective, we can see that the result will be negative, no matter how perfect the diet. Back of this, we must supply the body with the proper material in food; for if the material itself is not sufficient, the mechanism will not function. We must have a reasonably proper proportion of the sixteen elements that go to make up the body. Deficiency in the essentials necessarily brings about deficiency in the results, unless means are taken to correct them. The following case is illustrative of this point: The patient was nauseated throughout the nine months of pregnancy. The food eaten was retained for only brief periods of time. Naturally, the fetus received little nourishment from the food, most of it coming from the mother's tissues. A normal child was delivered weighing 7½ pounds, but having an abnormal appetite. It took pediatricians some time to develop an adequate diet. The baby was removed from the breast in a week, and great care was given to his diet. The physician saw him every four weeks, the diet was changed regularly and as soon as possible vegetables were added, with a reasonable supply of meat. Except in hot weather cod-liver oil has been given daily. Now, at 6 years of age, he presents a beautiful arch, teeth well spaced and not a semblance of a defect. This is the point I would make: His diet *in utero* was deficient, but undoubtedly his metabolism was good, for with correct diet the results have been all one could hope for. It might be interesting to mention the fact that the mother had a beautiful set of teeth until four years after the child's birth. They then began to show the results of calcium absorption, became soft and carious and have continued to deteriorate rapidly since. This brings up just one question which might be of interest: We know that many children present defects in the teeth at every visit to their dentist, even if these visits are close together, and that later in life there is a marked lessening of caries and still later what practically amounts to total absence. Here, we have evidences of anabolism, constructive metabolism, but in the case I have cited, with catabolism, destructive metabolism occurring early, may we expect a return to anabolism?

Dr. Boswell (closing): Science would not be scientific if it was not changeable. What today we see as a scientific fact, tomorrow is disproven, so I don't know what we are going to find out about some of this diathermy study, but the truth is, when we come to study the teeth we have got to recognize that there is something back of a tooth coming into the mouth and becoming a well fixed organ that doesn't change. I believe that the teeth change; I know it. I have as patients three elderly women who had the thyroid gland removed, and the teeth became so soft that you could take a knife and almost cut them. The body's protective powers were broken down, and we find the same is true in the climacterics of life.

ETIOLOGY OF PYORRHEA ALVEOLARIS, WITH A SIMPLIFIED TREATMENT*

By THOMAS B. HARTZELL, D.M.D., M.D., Minneapolis, Minn.

DISCUSSION

C. W. Hoffer, Nashville, Tenn: I agree with Dr. Hartzell that much pyorrhea is the result of the activity of the streptococci and staphylococci which gain access to the tissues surrounding the teeth through the gingival crevice. There is no doubt in the minds of the leaders of this specialty that débris and accumulations of food and plaques around the necks of the teeth act as an excellent medium for the propagation of bacteria, and through the series of inflammatory changes, by the action of both their toxins and ferments, cause the breaking down of the tissues; producing avenues of ingress of the bacteria into the deeper tissues. I have not been able to overcome these conditions when apparently traumatic occlusion has so injured the membrane surrounding the teeth, and so lowered its vitality that inflammation has set in with an ingress of bacteria following. By correcting the occlusion and through surgical procedure, I have been able, where there has not been too much bone involvement, to bring the tissues back to normal; then, with a stimulatory technic of brushing, I have been able to maintain a normal condition. I do find normal conditions of the gum tissue with teeth out of position, as Dr. Hartzell mentions in several of his case reports, where I would have expected traumatic occlusion to be present. Usually, in these cases, I find that the resistance of the patient is very high, and though teeth have moved into new positions, owing to the loss of teeth, we may not necessarily have a pounding or hammering of such teeth to the extent of trauma, due to the occlusion being balanced. I have several such cases on record. I am glad that Dr. Hartzell is not a great believer in medicines in the treatment of pyorrhea. It has been my experience, and the experience of the men I have followed, that the long and continued use of antiseptics and astringents has a tendency to lower rather than raise the resistance of the tissues surrounding the teeth. I agree that we should use extreme care in removing the débris and deposits from the cementum of the teeth, and at the same time retain as much covering of the necks of the teeth with the soft tissues as possible. But when there is considerable bone involvement and excessive granulomatous tissue in advanced pyorrheal conditions, I do believe that we are thoroughly justified in laying healthy tissue out of the way, with perfect access to the roots, thoroughly removing both necrotic bone tissue and the granulomatous tissue from the soft tissues, laying back in position the healthy tissue, and suturing and sealing with any of the surgical dressings which are now being used in surgical pyorrhea. This in my hands has given more positive and much more satisfactory results and in less time than when acids were used to dissolve or burn out the diseased and granulomatous tissue. This is followed in a very short time with a very vigorous brushing.

Dr. Hartzell lays little stress on the removal of deposits, clearing up deep pockets surgically and then cleansing, and I ask an expression of his opinion on this point when he closes the discussion.

Weston A. Price, Cleveland, Ohio: If Dr. Hartzell would consent to dropping one word from the subject of his paper, I would find myself largely in accord with his views. I would want to take out the first word—etiology. Frankly, I do not see in pyorrhea simply an expression of local irritation, nor do I see a local and systemic expression of a local irritation. I see, rather, a local expression of a combination of local and systemic factors, chief of which is a systemic factor,

*This paper appeared in the December issue of The Journal.

the trigger of the gun being the local irritation; and just as a gun cannot be very dangerous for shooting without a trigger, just so the trigger alone can't make a gun. In other words, I feel it my duty at this moment to put in this word, that we who are going out to practice have a great responsibility to our patients, but we who discuss this paper at this time, and send it out to the profession and to humanity as coming from this association of national prominence have a still larger duty, which is to carry over to the people somewhat of the larger importance of pyorrhea than the local irritation would have. Dr. Hartzell has referred to a number of cases in his paper, clearly illustrating traumatic occlusion without pyorrhea. I would call

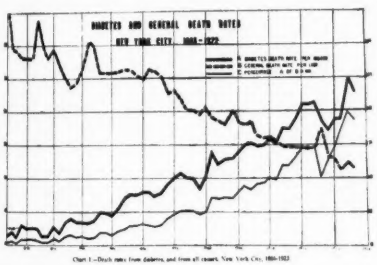


Fig. 1.—Death rate from diabetes and from all causes, New York City, 1866-1921 (Haven Emerson), showing an increase in diabetes of over 1,400 per cent, notwithstanding striking decrease from all causes.

your attention to the fact that you all see not a few but many cases of traumatic occlusion without pyorrhea. You also see many cases of pyorrhea without traumatic occlusion. We have, then, abundant evidence that a local condition alone cannot create the condition. Let us consider another aspect: According to Haven Emerson, diabetes has increased 1,400 per cent in the last sixty years. The top curve in Figure 1, the dotted line running across the page, shows the rapid decline of deaths from all causes in New York City and Manhattan, and in spite of that great general decline in death rate, there has been a progressive increase in the death rate as shown in the heavy, continuous dark line, which is the death rate from diabetes. Will you not, then, agree that something is influencing diabetes greater than our influence on morbidity and death in general? In that connection, and if I had time I could easily demonstrate it, I say that diabetics practically always have periodontoclasia, or pyorrhea, in some stage, and usually to a marked degree; and, further, those of you who are treating diabetic patients, (if you know it when you are doing it, and I don't suppose you always know it), will know that you have much less success and much less gratifying results as you treat your diabetic patients, than with nondiabetics. There is a direct relationship between the functioning of the islands of Langerhans and decalcification. Dr. Haven Emerson has shown (Fig. 2, lowest line) that people under 19 years of age are not developing diabetes.

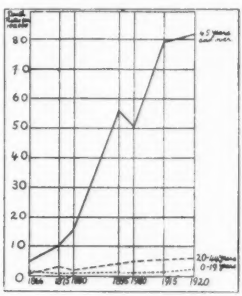


Fig. 2.—Comparison of the increase of diabetes in different age periods. (Haven Emerson.) Note the great increase in the group 45 years of age and over.

They do not constitute the group that have the increase, and in the second, the dotted line, the people from 20 to 44 years of age do not show an increase in diabetes, but the people 45 years and older show this enormous increase, as shown by the line that projects so high and so sharply.

Back of all this, we have the fundamental fact that some great metabolic change takes place after 45 years of age. Am I right in saying that you see pyorrhea developing more rapidly after 45 years of age? To what is this due? Not to calcium levels alone, but to the mechanisms that control those levels. For every diabetic patient, every patient with a hyperglycemia, has a disturbance of the mechanism of cal-

cification, and it is that disturbance which is the main lesion in pyorrhea.

In Figure 3, we have a dozen or fifteen people that never develop rheumatism, but many get diabetes and pyorrhea. They get the lesions of the decalcifying group. If they

CALCIUM METABOLISM. GROUP I. HIGH TOTAL. HIGH ACTIVE.

Case No.	Alkalinity index	Total calcium	Active calcium	Inorganic phos.	Organic phos.	Total Ca balance	Active Ca balance	Sugar	N. P. Nitrogen	Cholesterol	Total fats	Fatty acids	% Polymorphs.	% Small lymphs.	Systemic Condition of Patient
1348 MrKn	33.8	11.42	10.32	2.3	58.5	-15.0	-15.6	105	31	143	961	808	51.2	41.1	Normal after severe heart, relieved by removing dental infections.
1545 MrHe	33.0	12.13	11.62	3.9		+ 8.2	+ 8.2	100	27				52.5	37.0	Digestive.
1549 MaMh	32.4	11.42	10.96	3.1		- 4.6	- 6.1	132	25				70.6	21.5	Indigestion.
1560 MrWn	30.5	11.44	10.20	3.2		- 2.9	- 6.9	122	56				63.6	28.4	Skin irritation.
1565 MrPr	29.1	13.12	11.08	3.8		+10.0	+ 2.6	131	18				79.0	13.8	Chronic bronchitis.
1569 DrMy	41.3	12.64	10.57	3.1		- 0.9	- 7.1	97	34				60.5	29.0	None.
1572 MrBn	39.0	11.33	11.00	3.1		- 4.4	- 5.5	86	22	114	474	360	66.0	33.2	Mild nervousness.
1575 MrBh	34.2	11.28	10.06	3.6		+ 1.4	- 3.1	102	27	129	464	335	65.0	26.6	Colds.
1612 MrBn	31.0	12.70	10.06	3.1	36.7	- 0.4	- 8.6	105	34	190	746	554	65.3	20.0	Near normal, with history like angina.
1620 MrGa	35.4	12.55	10.52	3.2	31.4	+ 0.9	- 5.8	98	27	124	900	775	65.4	25.9	Nasal catarrh.
1624 JnKn	38.0	11.62	10.18	3.5	39.5	+ 1.5	- 3.6	101	26	134	470	236	63.0	28.5	Now normal. Had very active caries.

Fig. 3.—Typical blood pictures showing high total and high active calcium. Note that there are no cases of extreme negative calcium balance.

people all of whom have high total calciums. The figures are above all 11, and their active calciums above 10, and as a group, they are get tuberculosis, they make a poor fight because they decalcify tubercles. The problem as to what occurs regarding calcium in the

CALCIUM METABOLISM. GROUP II. HIGH TOTAL. LOW ACTIVE.

Case No.	Alkalinity index	Total calcium	Active calcium	Inorganic phos.	Organic phos.	Total Ca balance	Active Ca balance	Sugar	N. P. Nitrogen	Cholesterol	Total fats	Fatty acids	% Polymorphs.	% Small lymphs.	Systemic Condition of Patient
798 MrCy	34.4	11.20	8.80	2.2	58.0	-15.0	-20.2	97	29	89	713	624			Lassitude.
1268 MrOn	32.4	11.36	9.78	3.4		- 0.6	- 6.1	500	67	448	878	430	61.2	26.4	Hyperglycemia, but feels well.
1414 MaKn	39.5	11.06	9.87	2.8	62.0	- 8.0	-11.5	125	34	98	1025	912	55.0	37.0	Recovery from nervous break.
1484 MaMe	37.0	10.37	8.27	3.6		- 3.0	- 9.7	107	22	72	662	590	68.8	26.6	Heart irritability following goiter operation.
1573 MrHk	36.7	11.05	9.48	4.1	37.2	+ 5.1	- 0.6	81	30	111	800	689	55.8	29.4	Recovering from severe pyorrhea infection involvement.
1580 MrKr	28.6	11.43	8.70	4.2	39.1	+18.1	- 3.4	109	33	84	320	236	58.6	33.0	Pyorrhea alveolaris.
1583 MrHs	28.5	10.60	9.08	5.1	57.3	+14.6	+ 0.6	93	35	175	509	334	48.3	45.4	Severe lassitude.
1585 MrLe	30.1	11.41	8.80	2.0	34.4	-16.9	-22.2	127	31	89	833	744	53.0	41.0	Paralysis of eye muscle.
1586 MrDy	32.1	11.73	9.24	2.3	33.1	-12.6	-18.5	138	32	111	463	352	61.8	30.8	Recent nervous exhaustion.
1617 DrDt	34.5	11.12	9.02	1.9	13.6	-18.7	-22.7	104	27	128	696	565	68.3	24.0	Recent nervous exhaustion.
1619 MrBr	34.0	11.58	9.42	1.3	33.2	-26.7	-27.3	149	28	128	600	472	65.6	27.9	Mental depression.
1621 DrSy	39.5	10.42	8.49	3.3	31.8	- 5.6	-12.0	108	22	258	740	488	60.2	31.4	Pain in back.
1623 ChAn	34.7	12.53	8.17	3.3	33.2	+ 2.1	-12.5	107	22	93	687	584	64.1	26.2	Excessive caries.
1623 ChMn	36.4	11.12	9.17	2.6	51.1	-10.9	-16.0	98	26				60.0	30.0	Apparently normal.

Fig. 4.—Typical blood pictures of individuals with overload. Note high normal total calcium and low active calcium. There is marked negative calcium balance in most of these cases.

presence of an irritation depends on many things, as do the levels of each of our various calcium factors of the blood.

Figure 4 shows a different condition. The average in this group will be around 11, or over, for total calcium and the active calcium around 8 or 9. In those cases the patients have had good health but are breaking, and these two groups furnish 95 per cent at least of all cases of pyorrhea.

has destroyed the alveolar process nearly two-thirds of the way to the apex of the roots. This man belongs to the group who, in the presence of an irritant, will tear down bone. That is part of the mechanism of defense against the local irritant.

Here is a man who decalcified and at 61 years of age is in a condition of broken health, and at this time his total calcium has been reduced, as shown in the second column,

CALCIUM METABOLISM. GROUP III. LOW TOTAL. LOW ACTIVE.

Case No.	Alkalinity Index	Total calcium	Active calcium	Inorganic phos.	Organic phos.	Total Ca balance	Active Ca balance	Sugar	N. P. Nitrogen	Cholesterol	Total fats	Fatty acids	% Polymorphs.	% Small lymphs.	Systemic Condition of Patient
492 MaEn	37.1	9.57	8.28	1.8	28.6	-22.1	-24.6	116	33	129	733	604	64.2	26.6	Eight months pregnant.
589 MrPn	39.0	9.66	9.30	1.8	29.3	-22.4	-23.0	98	28	85	710	624	50.0	42.6	Anemia. Gall-bladder.
945 MrHk	33.4	9.73	8.52	3.5		- 4.3	- 9.6	92	40	148	1090	842	63.7	28.6	Pyorrhea toxemia.
1124 MaMc	35.9	9.27	8.86	3.7		- 5.3	- 6.9	105	38				60.0	41.4	Pelvic.
1622 MaBr	38.1	8.81	8.78	3.8		- 6.0	- 6.1	67	26				71.0	19.9	Two months pregnant.
1553 MrPr	37.1	9.51	9.23	2.3		-17.8	-18.5	98	26				76.3	12.8	Fatigue. Irritability.
1554 MrJn	38.2	9.69	8.84	3.1		- 9.1	-11.9	100	27				68.6	24.4	(Worry for daughter) No complaint.
1561 MaKe	33.6	9.81	8.92	2.6		-13.9	-16.2	108	28				51.0	39.3	Exhaustion and digestive trouble.
1589 MrPr	31.0	10.13	8.92	1.9	32.5	-20.0	-22.4	125	27	89	600	511	50.0	40.0	Lassitude and neuritis.
1601 MrSd	41.3	10.09	8.79	2.4	58.6	-15.4	-18.6	84	26	112	752	640	50.7	32.2	Asthma.
1622 MaMs	42.3	9.83	8.96	2.6		-14.1	-16.4	115	39				67.7	25.1	Pain about heart.
1624 J.Kn	38.5	8.58	8.78	3.8		- 7.0	- 6.2	112	26				70.6	19.5	Acute dental caries.
1625 MeSp	36.9	9.84	8.80	3.4	144.2	- 6.4	-10.0	102	37	111	281	179	58.2	32.4	Arthritis, bedridden.

Fig. 5.—Individuals with typical low total and low active calcium with typical severe overloads including dental infections.

In the next group (Fig. 5) are people who have a low total calcium and a low active calcium, perhaps because they have carried an overload so long that it has dragged down both the active and the total, but in that group the total calcium is around 9, most of them under 10, and the active calcium 8 and 9. These people are always ill. They do not have active pyorrhea though they may have chronic lesions; for they may have been in the other group and come into this grouping. The people who normally have the low levels of calcium may have tartar around their teeth and do not have that type of irritation.

In Figure 6, we have a typical case, the so-called horizontal pyorrhea. Decalcification

to 9. His active calcium is down to 8.5. This man could not possibly be well in that condition. With no other treatment than the removal of his infected teeth (all that we felt could not be safely treated), in a little less than a month, his total calcium has come up to 11 and his active calcium up to 9.4, a marked increase, and with a remarkable improvement in his physical condition.

Shall we, with a man who has that picture, simply treat a local condition? If we do, we invite a break in the metabolism that will shorten his life materially. It may be just such a break as has already presented itself in his family (a death from tuberculosis). There is a serious case of tuberculosis now in

the family. When you study the chart, you see that it shows that he had a high defense, as has also the family. There are no rheumatic group diseases. Shall we then, because he does not have heart trouble and rheumatism, think he is safe? This is the group that tends to develop cancer and diabetes and, if have lived to be 80 or 90 years of age are largely toothless, not because of the over activity of the modern exodontist, but because of pyorrhea; not simply because they had pyorrhea, but because they had a mechanism of defense which in the presence of an irritant did tear down bone. But that

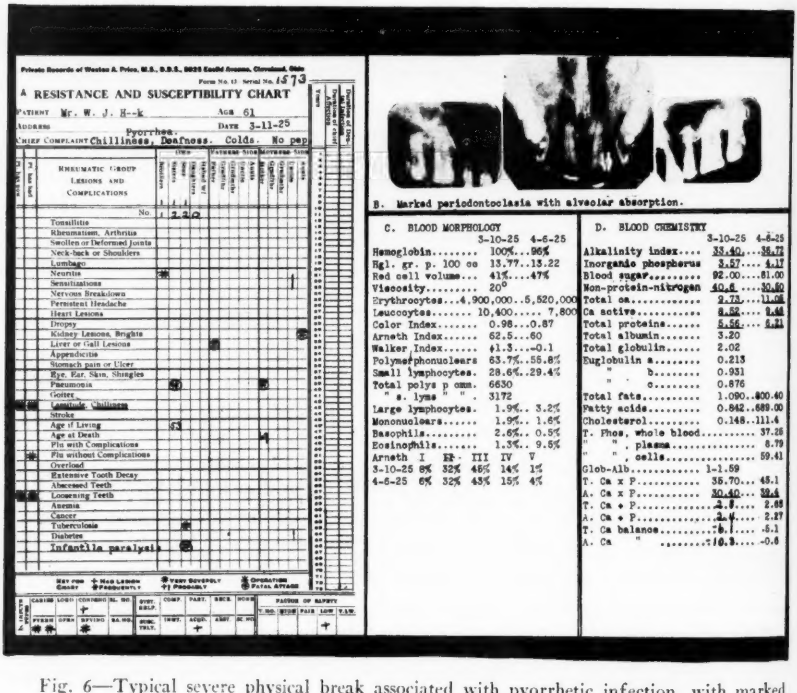
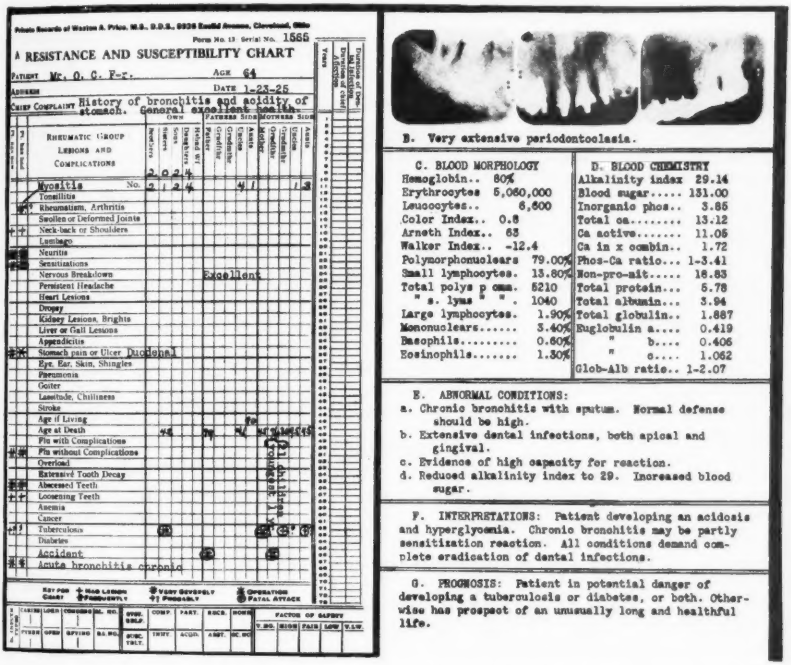


Fig. 6—Typical severe physical break associated with pyorrhetic infection, with marked improvement in less than a month following elimination of gingival and alveolar infection. Note absence of rheumatic group lesions.

they get tuberculosis, make a poor fight. Are we going to see this rising tide of 1,400 per cent increase in diabetes in sixty-six years and not take some warning from it? Are we simply going to treat a local lesion as though the teeth were the end to be desired, or are we going to see the larger view of that man's life and, if necessary, let him lose some of his teeth in order that he may have his metabolic processes in active capacity and function for a long period of life? Am I not correct when I say that these people in your practice who mechanism may disturb metabolism so that they are subject to other diseases; for it is the people who are never sick a day in their lives that develop cancer. It is not the people who complain with arthritis and heart involvement who get cancer and tuberculosis. I have searched this country far and wide for one single case of tuberculosis with prolific arthritis, and I cannot find one. You can find the other type of arthritis, which is due to metabolism disturbances, not to dental infection; so we have a larger problem

here than just what can we do to make this man's teeth last just as many years as possible. Figure 7 presents a history of a man 64 years of age, and his total calcium is up to 13, active up to 11, with a marked tendency to decalcification. We see four cases of tuberculosis in this family, and he has come before us with a chronic bronchitis as one of his symptoms. Another factor that I have just discussed: This man has a chart that is perfectly free from rheumatic group diseases, yet all the members of the family have lesions appearing in diabetes, cancer and tuberculosis. His total calcium is up to 13. He said, "I can drive a golf ball as far as any of them even at 64." He has a room full of golf trophies. His active calcium is up to 11. His father's sister is still living at 90. His father died at 94, from an accident. The mother's father died at 76, a young man. His baby was then only 1 year old. He had been married three times and had had twenty-one children. In Figure 7, we have the decalcification that takes place in pernicious anemia, a functional disease, and I want to warn you against seeing simply the constricted picture of what you can do for each individual patient as far as maintaining the teeth as long as possible, if they have a tendency toward pernicious anemia, because that in itself is a decalcification process again, and comes in that same pyorrhetic group. Make the teeth last as long as possible, if you can do it without embarrassing the last ten or twenty or thirty years of the patient's life.



A RESISTANCE AND SUSCEPTIBILITY CHART

Patient Mr. O. C. F-r. Age 64

Address Date 1-23-25

Chief Complaint History of bronchitis and acidity of stomach. General excellent health.

Rheumatic Group Lesions and Complications — Own / Fathers Side / Mothers Side

Myositis No. 2 1 2 4 4 1 1 3

Tonsilitis

Rheumatism, Arthritis

Swollen or Deformed Joints

Neck-back or Shoulders

Lumbago

Neuritis

Sensitiations

Nervous Breakdown — Excellent

Persistent Headache

Heart Lesions

Dropsy

Kidney Lesions, Brights

Liver or Gall Lesions

Appendicitis

Stomach pain or Ulcer Duodenal

Eye, Ear, Skin, Shingles

Pneumonia

Goiter

Lassitude, Chilliness

Stroke

Age if Living

Age at Death 46 70 74 68 [illegible]

Flu with Complications

Flu without Complications

Overload

Extensive Tooth Decay

Abscessed Teeth

Loosening Teeth

Anemia

Cancer

Tuberculosis

Diabetes

Accident

Acute bronchitis cronic

Key for Chart: + Had Lesion; ? Probably; Very Devoted; Operation; Fatal Attack

Factors of Safety: Vit. Org. Self; Comp. Thyr.; Fast. Acid.; Rick. Anat.; Bone Nec. Thyr.; Vit. Org. Diet; Fair; Low; V. Low

B. Very extensive periodontoclasia.

C. BLOOD MORPHOLOGY

Hemoglobin..	80%
Erythrocytes	5,060,000
Leucocytes..	6,600
Color Index..	0.8
Arneth Index..	63
Walker Index..	-12.4
Polymorphonuclears	79.00%
Small lymphocytes.	13.80%
Total polys p cmm.	5210
" s. lyms " " .	1040
Large lymphocytes.	1.90%
Mononuclears.....	3.40%
Basophils.....	0.60%
Eosinophils.....	1.30%

D. BLOOD CHEMISTRY

Alkalinity index	29.14
Blood sugar.....	131.00
Inorganic phos..	3.85
Total ca.....	13.12
Ca active.....	11.05
Ca in x combin..	1.72
Phos-Ca ratio...	1-3.41
Non-pro-nit.....	18.83
Total protein...	5.78
Total albumin...	3.94
Total globulin..	1.887
Euglobulin a....	0.419
" b....	0.406
" c....	1.062
Glob-Alb ratio..	1-2.07

E. ABNORMAL CONDITIONS:
a. Chronic bronchitis with sputum. Normal defense should be high.
b. Extensive dental infections, both apical and gingival.
c. Evidence of high capacity for reaction.
d. Reduced alkalinity index to 29. Increased blood sugar.

F. INTERPRETATIONS: Patient developing an acidosis and hyperglycemia. Chronic bronchitis may be partly sensitization reaction. All conditions demand complete eradication of dental infections.

G. PROGNOSIS: Patient in potential danger of developing a tuberculosis or diabetes, or both. Otherwise has prospect of an unusually long and healthful life.

Fig. 7.—Typical patients with high defense breaking at late middle life. Note the alveolar absorption, absence of rheumatic group lesions and several cases of tuberculosis, including patient's suspicious bronchial symptom.

J. P. Corley (*Sewanee, Tenn.*): I would like to ask Dr. Price if his extraction of those teeth is not really local treatment?

Dr. Price: The infection about the tooth furnishes a toxic material, of which Dr. Hartzell has told you, which cannot be neutralized with soap when you get it into the constitution.

Dr. Hartzell: Answer yes, or no.

Dr. Price: I say the extraction of those teeth prevents the generation of the toxic material, which has a marked effect on the parathyroid glands, so you take away one of the injuries to metabolism by getting completely rid of that tooth. Your suggestion is a good one.

Arthur H. Merritt (New York City): As a clinician, there are two or three points which I should like to emphasize. The first is, traumatic occlusion should be defined as that occlusion only which traumatizes. Teeth may be as irregular as the imagination can conceive without producing trauma, which means injury to the supporting tissue. Also teeth that are regular may traumatize. Therefore, we should be careful in our definitions of traumatic occlusion. Regarding bacterial invasion, I believe that Dr. Hartzell is quite correct in the statement which he makes regarding it. In 1919, Noyes, in his study of the pathology of the periodontal membrane, made the statement that the changes which occurred in the pericementum were caused by bacterial invasion following along the line of the lymphatics. More recently, Box has discovered "rarefying pericementitis fibrosa," this same lesion which he ascribes to traumatic occlusion. I am inclined to think there is a sense in which both are right. Traumatic occlusion lowers resistance and thereby makes bacterial invasion possible. I should also like to call attention to the possibility that in itself this will produce disease. Those of you who were here yesterday and listened to Dr. Hirschfeld's paper on his studies of the skulls in the American Museum of Natural History in New York were interested to know that he finds teeth whose enamel is entirely worn off the occlusal surfaces, proving that they have been subjected to great stress, without the slightest disturbance of the surrounding bony support of those teeth.

What was the reason? It was not because there was not great strain, nor because the supporting tissues of the teeth were not subject to bacterial invasion, but because these individuals used their teeth so vigorously that they translated vigorous use into well nourished and highly resistant tissues. The value of Dr. Hartzell's scouring of the teeth in my opinion is due to the fact, not that they have been scrubbed and bacteria eliminated, though that may be helpful, but because the circulation has been stimulated and they have become more resistant. In other words, he is doing artificially with his scouring process what our prehistoric ancestors did by the use of course and fibrous foods.

Dr. Hartzell, (closing): In reply to Dr. Price, permit me to ask, in view of the fact that his statements regarding invasion of bacteria have not been supported by actual investigation: How does he know in these instances that bacteria are there? When the resistance, the local resistance, is kept very high, by scouring the teeth, as he approves of doing in endorsing what I have said here, the invasion is checked and is comparatively slight.

The Egyptians, 4,000 years ago, suffered just exactly as we do now, and they lived a comparatively simple life so far as their foods were concerned. A book by Sir Marc Armand Ruffer, compiled by Dr. Moody of Chicago, shows dental lesions confirming what I have said. Dr. Merritt stated that when weight is delivered, against the teeth, it may be delivered exactly true, and still there may be traumatic occlusion. He tells you, too, that it can be delivered sideways, and traumatic occlusion not be present. Now I leave that to you. If you believe it is so, all right. I don't. I am grateful for the words of approbation. Remember, the title of this paper is the treatment of this disease simplified. I am giving you this morning, and have given you, the things that have made for the largest possible success in my work, and I have done nothing else now for thirty years. It is simple, direct, easy of application, and reveals a positive result. Dr. Price talked about calcium in its relation to pyorrhea. He made assertions that would lead you to think that this disease which attacks the investing tissues of the teeth is largely one of old age. I saw a child two years and a half old lose every tooth by infection. They were so loose that one could pluck them out with thumb and finger, and the child made scarcely any objection. That is strange, indeed, but true. I saw but one case of that sort, but I am constantly seeing children with lesions around the necks of the teeth. A young man, at least 21 years old, came to me last week, with

lesions one eighth inch deep between his molars. He was, apparently, on a good, normal diet—milk, eggs, green vegetables, fruits, and still there were these deep lesions between the teeth. I placed him under treatment, and I dismissed him a week ago, after three weeks' treatment by the scouring process. The result was that the crevices filled with granulation and the epithelium was bridging the ulcers, and I am sure that in another week there will be a new, healthy, shining coat of epithelium on the ulcers covering the space bridging over between the teeth. It is not a disease of old age. It is a disease of life, from the cradle to the grave, and I don't believe that the food habits of this country are robbing it of the ability to gather calcium. Dr. Price will say that the individual who is getting a quart of fresh milk daily, and still has pyorrhea, probably has one of those illusive things that prevent him from appropriating it. Frankly, I owe much to Dr. Price. He is the man that started me to digging. Dr. Price has talked about calcium here. I hope that you will be willing to test the things that I have advocated, and not attempt to study the blood chemistry in order to determine whether the calcium balance is all right. If you heard one of the other papers, you will know that it would be quite impossible to get dead fish livers enough to activate the calcium of the country. In the meantime, you might do something by scouring the teeth, if you tried.

I am not unmindful of the fact that Dr. Price discovered the germ that caused pyorrhea in 1916. He showed in San Francisco, Seattle, Minneapolis, and other places a bacillus "X" which he got on blood culture. In all his pyorrhea cases, he was equally certain that he was right. It was proved that bacillus "X" was the hay bacillus, the most difficult thing to fight in keeping cultures clean. I have not heard him saying much about bacillus "X" lately. Might it not be possible that some of these abstract statements that he has made he will modify after a while? Please do not be discouraged with this matter. I do not believe that the lack of calcium is in any proportion so important a problem as checking the local growth of bacteria on the tooth surface and adjacent to the teeth, and I do know that an effort to check this growth will yield a great meed of success to every individual who conscientiously puts it into operation. I am going to leave this matter right here with you now, to adopt or not, as you see fit, and if you wish to delay work on your cases and attempt to bring about normality by blood chemistry, which you do not know how to do, and which I do not know how to do (I should have to seek an expert in biologic chemistry to have it carried out) and which so far Dr. Price has not taught us how to do, and which such men as Dr. Albert P. Matthews, one of the greatest biologic chemists of this country today, is still in doubt about, I beg of you, in the meantime, while you are settling these difficulties, adopt the régime of cleanliness.

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Editorial

1926

The beginning of every year forces reflections on all humanity—some frivolous, some serious—depending on the individual. It is a period of stock-taking, not only in the commercial world, but also in the world of thought and mind. And it is well that this is so. No man or woman should permit this period to pass without a general checking up to determine their present status and to plan for the future. If we did not pause and take stock at times, we would be too likely to plunge blindly ahead without a clear conception of whither we were drifting, and the logical time to check up is at the beginning of the year.

To take stock properly we should look both ways—behind us and before us—but a mere glance behind is sufficient, just enough to show us which way we have been going. The thing that concerns us most is the future. The past cannot be recovered—let us waste no time in regrets or in vainglorious self-commendation. We may make of the future almost what we will—let us approach it with this conviction. To aim high and

fail is not necessarily a disgrace, but to aim low is unpardonable. Follow Emerson's advice and hitch your wagon to a star.

In our own profession, 1926 holds much of promise. The one outstanding event is, of course, the coming Congress, details of which will be given in our next issue. But, in our own beloved Association, there is much to be done, and we must rally to the support of our officers in no uncertain or half-hearted way. The machinery of the organization must be kept going at full efficiency; and, in this connection, it is not too early for our state societies to begin to study their particular duty to the parent body. This relates to the appointment of their delegates, and to the necessity for the greatest care in their selection. The House of Delegates is becoming more and more a deliberative body, and today they do not do things in the impulsive, happy-go-lucky way they did a few years ago. When it is recalled that this is the great legislative wing of our organization, where all the laws are passed, it at once becomes apparent how important it is to have men of the highest constructive and executive ability. Latterly, we have seen a vast improvement in the character of men selected, and this is a healthy indication. A man should not be chosen merely because he is a fine fellow and a good mixer, but because he has a thinking brain and has the interests of the Association at heart.

There will be business of importance to be brought before the House of Delegates at the 1926 meeting, and the membership should assist the officers in every way possible. We are fortunate in our officers for the ensuing year. The President, Dr. Foster, is studying the best interests of the organization and is determined to give us a good constructive administration. The President-Elect, Dr. Biddle, whose portrait we are publishing as our frontispiece in this issue, is a most worthy lieutenant, and with these two men at the helm, 1926 should be a banner year. Let us help to make it one.

Another 1926 achievement must be a clarification of the pulpless tooth problem. This question has assumed a status where something more definite must result from its considera-

tion, and it is hoped that the coming year will do much toward clearing up some of the present confusion concerning it. The profession owes it to the public that a more concrete and universal opinion be formed as to the proper disposition of the pulpless tooth, and we should go a long way in twelve months toward this consummation.

In passing, it might also be said that the science and art of denture construction will bear a little systematization. There is too great a diversity of opinion on this most important subject, and whether or not a year is sufficient time in which to arrive at a uniformly definite and satisfactory understanding by the splendid men who are working on it, we can only say that the occasion is ripe for a concerted and serious attempt to place the entire question on a more stable basis.

In short, there is sufficient of vital interest looming large in the immediate future to engage the best minds of the dental profession, and the next twelve months should see much of this well started on the way, if not indeed brought to an ultimate decision.

For our membership as a whole, the wish is hereby expressed that 1926 may bring in large measure a realization of those high hopes and worthy ambitions which at each New Year form the chief *motif* of a progressive humanity, to the end that the year at its close may be reviewed with real pleasure and satisfaction.

AN OPEN LETTER TO ONE OF OUR MEMBERS BY THE EDITOR

In the returns from the appeal made to our members through the medium of the Christmas Seals, the following letter was received.

"Dear Sirs:

I am returning stamps. I would be glad to contribute but feel that if a dentist cannot save his money it is no fault of mine. I can save money, have practiced eleven years, and in another five I could be independent, so I cannot see why these men need help,

it is generally their own fault, and if they don't know enough to save for a rainy day, there is always the poorhouse and the Red Cross, and other agencies to help them, to which I contribute.

Yours truly,

_____"

THE EDITOR'S LETTER

My Dear Doctor:

I thank you for the very frank manner in which you have stated your position in this matter. It is always salutary for us to have a glimpse of the other man's point of view. It is also somewhat stimulating to know that a man practicing dentistry can become "independent" in sixteen years. But are you sure about this? How do you know you will be independent? What guarantee have you that you will not be taken ill in the meantime? I have never known an individual who had an absolute assurance of perfect health and full efficiency five years ahead. And if you are fortunate enough to have good health, and your accumulations proceed as favorably as you plan, and you are able to lay aside sufficient in the next five years to keep you the remainder of your life, does this make you "independent"? I think not. Do an individual's obligations end with his own personal support? Is this the height and depth of a man's ambition, and the sole purpose for which he was placed on this earth? Is it in full accord with the best traditions of the race? Does it represent the most exalted conception of design or duty? Is there no bigger, broader or better life than this? Does it contribute to your happiness to sit down and "lay the flattering unction to your soul" that you are accumulating just enough to buy food for yourself and pay for lodging? Maybe you smoke, but somehow I doubt it. If you do, and if you have reckoned the probable cost of cigars or pipe in your claim of independence, how much satisfaction do you hope to get from seeing the smoke—*your* smoke—curl up in the evening of life, and write in the air the legend that you have helped no one but yourself?

No, my friend, you are making a mistake. Unwittingly, you have allowed selfishness to enter your heart, and it is narrow-

ing your vision till in the end the only word written across the sky line of your horizon will consist of four letters, and it will be spelled s-e-l-f.

I think you have noble impulses—you say you contribute to the poorhouse and the Red Cross. From the depths of my heart, I commend you for doing this, and I thank you. But supposing all your plans shall go amiss, as they have gone with the best of men, and supposing that misfortunes over which you have no control bring you to the verge of abject poverty, how will you feel as a former professional man when someone points out to you the turning in the road which leads you to the poorhouse, or when the Red Cross informs you that most of its function is emergency work, and that it cannot provide for your permanent support? You are a fellow practitioner of mine, and I like to call you my colleague. Somehow I have an ingrained affection for members of my own profession, and I hope never to see one of them go to the poorhouse, or appeal to outside charities for support. It was this idea which impelled the noble men who started the Relief Fund in the American Dental Association, and it is this which has called forth the spontaneous contributions year after year from members in every section of our land till the fund this Christmas will reach more than $165,000.00. And this amount has been raised without the slightest hardship on anyone. Is not this something to think of with pride and with pleasure? Does it not bring to even you, with your insular point of view, just a little bit of a thrill to think that this has been done by dentists?

Let me quote from two other letters, picked up at random—one from the far east, and the other from the far west. The former says: "I am enclosing my bit to help carry on. Wish it were possible to make it a hundred times *bigger*." The other says: "Enclosed find my check for the annual dollar. I am mighty glad to do this as one old dentist, Dr. ———, here, is now getting a monthly check. It is a great boon to him; in fact before this aid was secured, he threatened to kill himself—now he is happy and getting along nicely."

You thus see the difference in the points of view of different men. If you had it in your power to change the point of view of any man, which would you do—change that of these two men, or change your own?

Wishing you the greatest success in life, and the greatest happiness, I am

Your friend,

THE EDITOR.

ORTHODONTIA

The science of orthodontia came into the dental profession as a distinct benefaction. Groping at first in the mists and shadows of experimental uncertainty, it has emerged into the clearer atmosphere of a brighter dawn, where its achievements are penetrating the clouds and shedding sunshine over the hearts and minds of men. Sponsored by a small band of noble and devoted enthusiasts in the beginning, it has swept across the horizon of our professional activities till it embraces today the best energy of very many earnest practitioners, with an ever-increasing interest on the part of the profession and the public at large.

All honor to the pioneers in this beneficent art—the men who blazed the way—who went ahead and made a path through the dense wilderness of ignorance—long before there was system or cohesion in the movement—long before there were schools teaching the art, or societies everywhere discussing the latest and best in this wondrous specialty. It would sometimes seem as if the keenest and most progressive minds in the profession had rallied to the banner of orthodontia, and were devoting their very lives to its development.

And what a blessing it has all been! Think of the countless lives it has sweetened by its beneficence. It has freed humanity from one of its most glaring deformities, and has transformed the hideous imperfections of Nature into the essence of symmetry and beauty. It has waved the magic wand of its subtle art

across the distorted features of little children, and lo, they have come forth perfect in the image of divinity. It has relieved the aching hearts of mothers, and added to the joy and pride of doting fathers. It has removed from budding youth the blight of prejudice, and destroyed the handicap which threatened to mar a human life.

It has added to health, to beauty, to opportunity, to advancement. It has snatched from many a sensitive child the horror of derision, and planted in his heart the seeds of hope and confidence and courage. It has given children a fair chance where Nature had threatened to trample them under the ruthless feet of deformity. It has sweetened the lives of countless youths, and made possible careers of achievement and success. It has turned despair into hope, and discouragement into the very joy of life.

It has, by its marvelous artistry, molded the human countenance into lines as fair as those of Apollo, and has changed the features of a freak into the profile of a god. It has wrought modern miracles great as those recorded in the script of ancient days, and made the impossible of yesterday the routine and commonplace of today. It has spread the blessings of beauty and harmony over the blighted lives of myriads now on earth, and will do the same for myriads yet unborn.

Out of the chaos of the past—the doubt, the dread, and the despair of disfigurement—has come this beneficent science, to bring solace to the sons of men. And the end is not yet. There are greater achievements ahead, and the future holds high the banner of promise and of pledge.

In the glowing east, we see the many-tinted bow beckoning in the dawning of a better day, when "all the children of all the people" shall be brought under the blessings of this benevolent art, and the cry of despair coming from the hearts of little children shall be banished from the ears of men.

When the possibilities and significance of orthodontia are fully recognized by the world, there shall be recorded for dentistry one of the greatest achievements and greatest tributes that have ever fallen to the fortunate lot of any calling.

DEPARTMENT OF DENTAL HEALTH EDUCATION

PREVENTIVE DENTISTRY—A SUCCESSFUL METHOD

By STANLEIGH R. MEAKER,* D.D.S., D.O., Albany, N. Y.

(Read before the New England Health Institute, Portland, Maine, May 5, 1925)

IN THINKING over the title of this paper as I was grouping the items that I purposed to discuss with you, it occurred to me that this is not preventive dentistry but rather a method of preventing dentistry.

I am taking it for granted that you are all only too well acquainted with operative procedures in dentistry. You realize, too, that, technically speaking, preventive dentistry consists of those procedures directed toward the relief, repair and restoration of defective or lost teeth and the soft tissues of the mouth. The recognized objective of such work is the conservation of the remaining dental and other oral tissues and their maintenance in a more useful and less harmful condition. Such also is our aim in the methods we employ in preventing dentistry.

Nearly twenty years ago, a wave of what might be called dental reform swept over not only the dental profession but also that of medicine and also attacked the lay public. Recognition was then generally given to the fact that septic conditions in the mouth have a marked effect as causative and contributory factors in many bodily ailments. Investigations in most civilized countries disclosed the almost universal existence of insanitary mouth conditions. It was only natural, in the enthusiastic rush for a panacea for all such ills, that many disappointments were experienced. Wholesale extraction of teeth, for a time thought to be such a panacea, failed. Especially was this so in many cases of chronic ailments in adults.

It is impossible to determine when and to what extent our human economy may build up an immunity to almost any infection. We see individuals harboring, with apparent impunity, the worst kind of infective material in their mouths. And again we find these same severe conditions, as well as what is apparently a very small infective area, as the undoubted cause of some other possibly remote disturbance. Hence, we have had to concede that oral infections may be borne with impunity, at least for a time, and by some individuals. And we also concede that the healing of diseased oral tissues may be effected by other means than extraction of the teeth. Such is modern preventive dentistry. But while we are conceding all this, we must not lose sight of the fact that septic matter is

*Supervisor of Oral Hygiene, New York State Department of Education.

always a potential venom and that all reasonable means should be taken to lessen its quantity and potency. It is important to remember in this connection, too, that the toxins generated by micro-organisms in a very unclean mouth are much more virulent than the same brand of germ in a comparatively clean mouth.

The foregoing picture is not an encouraging one when we think that there are dentists enough in this country to care properly for only about 10 per cent of the population. The desirability of a means of obviating the need of such service then is quite apparent.

Dangerous septic conditions of the mouth begin to develop at about the time temporary dentition is completed, say at 3 three years of age. This is also about the age of ability to partake of and utilize quantities of all kinds of foods and when habits of choosing such foods also develop. And here let me say that, since a varied diet seems indicated as best for our sustenance and growth, I believe children should not be allowed to form intense likes or dislikes for certain foods. Although I do not intend to devote any time here to a discussion of nutrition, I would call to your attention the fact that the crowns of all the deciduous teeth are perfectly formed before birth. As a rule, the deciduous teeth are structurally well made, it being Nature's custom seemingly to attend to this detail at the expense of the tissues of the mother. Maternal diet during pregnancy, therefore, is more important as a means of maintaining a proper balance in the prospective mother's tissues than in directly affecting those of the fetus. Let me review briefly some other facts relative to tooth and jaw development.

The crowns of the permanent teeth begin to form at about the time of birth and continue to develop for several years. Hence, it will be seen that the structure of the enamel of these teeth may be materially affected by dietary conditions. The eruptive force is created by the growth of the root behind the crown; thus the tooth is literally pushed into its ultimate position. The process is the same in both deciduous and permanent teeth. Any localized pain during dentition is in the forming tissues of the root end and not in the overlying gum. Either congestion or blanching of the gums may be present. Lancing at the proper time, releases the pressure and relieves the pain and various nervous reflexes.

The transition period and process, from deciduous to permanent teeth, is one of vital importance to the child and one on which reliable information of the laity is wofully lacking. For all practical purposes, it is sufficiently accurate to say that the deciduous teeth begin to appear or erupt when the child is about 6 months old, the others following at approximate intervals of six months. The lower teeth usually precede the uppers by a few days or weeks. The entire number of ten upper and ten lower baby teeth are thus ordinarily in place by the time the child is 3 years old.

It should also be remembered that the teeth erupt in pairs—a right and a left at about the same time. The cuspid, or third tooth from the median line on each side, skips its turn to enter the arch and appears after the first temporary molar just back of it has taken its place. The second temporary molar erupts last and is last to be replaced by a permanent tooth; which, by the way, does not occur until about the twelfth year. After completion of the deciduous arches, three years elapse before the first permanent, commonly called the "sixth

year," molar appears. These four teeth come in posterior to all the deciduous teeth and before any of the latter are shed. As I have just given you a simplified formula for determining the eruptive time of the deciduous teeth, viz., one every six months, it may be well here to say that the permanent teeth erupt at approximate intervals of one year. After the appearance of the first permanent molar the deciduous central incisors are replaced by the permanent, at the age of 7. Next, the lateral incisors appear, at 8 years. The first bicuspid replaces the first temporary molar at 9; the cuspid is replaced at 10; the second bicuspid replaces the second deciduous molar at 11, and the first permanent is skipped for the second. These ages are only approximate and subject to considerable variation either way, but it is so much easier to remember than the textbook schedules of between 5½ and 7, 7 and 9, 8 and 11 years, etc.

The mere fact that the first permanent tooth to appear is not a front tooth but a back one, linked with the belief that temporary teeth need no care, is the cause for the so frequent loss of or serious defects found in the first permanent molars. Other annoying misconceptions on the part of many are that the deciduous teeth have no roots and that it is perfectly natural for them to decay. The truth, of course, is that deciduous teeth do have perfectly formed roots, and rather than disappearing by decay of the crowns when their time is up, they should be pushed out from above or below by the permanent teeth, their roots being absorbed by the blood. Here, again, is an interesting though trouble-making process. If a temporary tooth decays to the extent that the pulp dies, the process of resorption of the root practically ceases and the permanent tooth will turn and push in beside the deciduous tooth, coming through the gum out of line. This is also a frequent cause for permanent teeth becoming impacted in the jaws, with the sequence of disturbances that follow. Early loss or breaking down of the last deciduous molar also lets the first permanent molar tip forward. This disturbs the approximation of the upper and lower teeth all along the line and is another cause of irregular teeth. One other cause for crowded permanent arches is lack of sufficient chewing and grinding force exerted on baby jaws to cause proper growth and expansion of the arches. The permanent anterior teeth are a third broader than the temporary teeth that they replace. Obviously, then, we should give thought to the selection of such foods as require considerable masticatory force. Parents are astonished to learn that every child 6 years of age has all its permanent teeth packed away in the jaws awaiting their turn to take their appropriate places in the arches.

Consider, then, these three facts: All mastication for the first six years of life must be done on deciduous teeth; complete transition to the second teeth is not complete until nearly the twelfth year; decay of any tooth means infection. Is further evidence necessary to convince one that the deciduous teeth are not mere ornaments, that the Architect of the universe built wisely?

The fact that an alveolar abscess only follows a dead pulp, or what is commonly called a dead nerve, is not understood. The terms abscess, ulceration, blind abscess and fistula are confused. This condition, we know, has the most far-reaching complications; at the same time, it is a most difficult one to diagnose accurately. Still another factor is a right understanding concerning congested and inflamed soft

tissues of the mouth. Bacteria and their toxins are but slightly absorbed in cavities of the teeth. They must come in contact with a freer blood current, such as exists in the very vascular mucous membrane. Fortunately, our digestive juices and the white blood corpuscles are good germicides, but they have limitations, and extension of infections occurs. Hence, cleansing the mouth just enough to keep food from lodging on the teeth and causing them to decay is not all that is needed: we must keep the gums free from irritations both mechanical and chemical and promote a normal flow of blood in them, which is indicated when they are a light pink.

I have dwelt on these phases of our subject because they are the main elements to be met in the strife to overcome and prevent. The existence of these physical defects and misconceptions is far from a wilful condition—it is due rather to a pure lack of information.

The members of the dental profession itself, if perhaps not exactly uninformed on this matter, have become so preoccupied with reparative work that they have lost sight of much of its significance. This is manifest in their belittling the importance of the deciduous teeth and a disinclination to care for them properly. A more charitable view of such an attitude is that the deciduous tooth that the dentist sees is usually in very bad condition, and no one likes to work on such cases. Wholesale corrections being impossible and inadequate, our only logical procedure is one of education looking toward prevention. It has, therefore, become generally accepted that the earlier and more thoroughly we can instil proper information in our children the more profitable will be our efforts. Schools offer the best opportunity for such a program. Dental clinics equipped for giving operative treatment for existing defects have proved a splendid aid in demonstrating the benefits of such treatment and in indirectly intimating how much better earlier attention would have been. Such clinics, however, are expensive to run and difficult to manage. Studying the question, then, from an economic point of view, it has been determined that, financially and educationally, better results are obtained by other means than the operative clinic.

To Dr. A. C. Fones, of Bridgeport, Conn., we are indebted for the dental hygienist. As you undoubtedly know, these young women are instructed, in an elementary way, in the theory of dental practice. Their practical training is confined to cleaning the teeth, as is their permit to practice under the statutes. Employed in school work, the dental hygienist is proving herself a worthy dispenser of service and information. As she cleans the child's teeth, she talks to him in a friendly way, telling him interesting facts about teeth and health. Then, with his interest aroused, she can point out his own particular defects and advise him concerning their correction. Such treatment almost entirely eliminates the proverbial fear of the dental chair. Many dentists have told me that, whereas they formerly dreaded to see children come to the office, it is now a pleasure to work for them. Not only has their fear disappeared but they are also much better informed, take better daily care of their teeth and have repairs made before they reach the desperate stage.

Classroom talks of from five to ten minutes are also productive of good results. As children are always glad to have stories told them, the hygienist if she will exercise her ingenuity, can fit

some truth of dental hygiene into almost any story suitable to the age of the children she is addressing. Several short talks during a year, each carrying in a pleasing way a few points of information, will give splendid results. Classroom teachers are reticent about having the routine of their work interfered with as a rule, but I have frequently heard them say that such short interruptions are a pleasure. The information is of value to the teacher also and the interest displayed by the children is a pleasing relaxation. Usually, the dental hygienist makes a careful record of the mouth conditions of each child, sending to the parents a note calling attention to the need of any repairs. Some cases require a follow-up visit to the home to explain the conditions and secure results. This the hygienist should be able to accomplish also. The mere presence in the school of the dental hygienist is a constant reminder to the pupils to heed her advice.

Another way of stimulating interest in dental care in a community is for the hygienist to stage a little playlet depicting some dental truth. The children, of course, are the performers, sometimes even originating and making their own scenery, costumes and properties. In some places where a dental hygienist is not employed, teachers and school nurses have accomplished untold good through these same means. Teachers may also be found who will occasionally find it convenient to develop a point for oral hygiene in some of their regular classes. For instance, the fact that 90 per cent of our toothbrushes come from Japan and that most toothbrush bristles come from Siberia may be brought out and elaborated on in a geography class. An arithmetic class is a splendid place to work out statistics of a simple sort pertaining to the number of cavities in the teeth of the class. The average number of cavities per pupil ranges from three to seven or more. If each child loses four days a year because of toothache, which actually occurs, how much has the whole class lost, etc., etc.?

An interesting story comes to mind here of one community in which that last statement was true.[1] As an added incentive to the pupils to secure needed repairs and maintain clean mouths, a holiday was offered to each class, then to each school registering 100 per cent as having certificates from their dentists that all needed repairs had been accomplished. This included teachers also. As a result, absences from toothache were eliminated, and in four years the average attendance was raised from 83 to 98 per cent. It is evident that something more than just clean teeth has resulted from such a campaign. The morale of the whole group is raised; and the general health is improved, permitting an increased capacity for mental vigor. The number of students repeating a year's work has been decreased as much as 20 per cent and numerous cases of supposed mental delinquency have been relieved of such a handicap. A number of times this winter, I have stood beside a school nurse as the children filed past for their physical inspection and noted the splendid condition of their mouths—and that was in rural districts from 5 to 8 miles from the nearest dentist.

I feel therefore that we have just cause to conclude that educational means are of greater value than clinical in creating the right mental attitude toward this subject. There are places in our state where, under this system, more actual reparative work has been secured

1. Sutton, W. A.: Health and Education, J.A.D.A., 12: 273 (March) 1925.

among school children through their own dentists whom they have to pay, than when free or cheap dental service was available. Dental clinics are, of course, an asset to any community in which charity must be dispensed. Our aim is to impress on the school child and parent their personal responsibility in this matter, purely from a health standpoint.

The equipment necessary for a school dental hygienist need not be an elaborate one—$300 will buy the very best. This figure may be reduced to less than $100 by the use of a lighter, less expensive chair, a foot instead of an electric engine, and other simpler equipment. Either sort is portable, a very desirable feature, as we find it better to move from school to school.

The educational standards for a license to practice as a dental hygienist in New York State have been raised so that a high school education or its equivalent is required before the one year of professional study. In 1926, the State of Pennsylvania will require one year of collegiate work prior to the professional study. We are finding that, for the administration of this work in public schools, something more is necessary than our present qualifications. To this end, preparations are now under way for giving additional work to those who wish to enter school service. This will be along the lines of psychology, sociology, public speaking and elementary pedagogy. Permission is granted this year to a limited number to take a six weeks' summer course, along with the school nurses, at one of the state normal schools.

Through our system of state aid, a sum, not to exceed $700, as one-half the salary of a dental hygienist, is now available. In the past year, this provision has considerably increased the number of schools employing dental hygienists. The same provision applies to dentists, but relatively few are employed. Other assistance from the state in this work is confined to my services. The position of supervisor of oral hygiene comes under the medical inspection bureau of the state education department; thus, the work very appropriately becomes an intimately associated part of the whole problem of health education. There being no others employed by the state in this specialty, the duties of the office are interestingly varied. Our chief objective is to encourage and assist boards of education to incorporate the teaching of oral hygiene in their health programs. Talks are given to any kind of audience that will listen; surveys are directed to determine, and enlighten the community on, the particular local conditions; an attempt is made to standardize the procedure of the school dental hygienists and to have them adopt suggested examination and report blanks. To meet the requests for printed matter, we have a leaflet entitled "The Sixth Year Molar and the Baby Teeth." Other material of this nature is in great demand and is being compiled as time permits.

In the visual instruction division of the education department, we have a very creditable set of stereopticon slides on oral hygiene, which may be loaned by any school or responsible individual. Mounted photographs of the same subjects are also available, but no motion pictures, I regret to say.

The state dental society has adopted a scheme to augment the limited support given this subject by our state government. For three years, they have employed dental hygienists to give practical demonstrations for one or more

weeks in the schools. This has developed into a real service bureau, the school boards paying for as many weeks' service as desired. As a result, several localities have employed a hygienist permanently.

Although we feel that much has been accomplished in this field of education and that general appreciation of the subject has been raised, much yet remains to be done. There are many handicaps, officially and professionally, and among the laity. Patience and sincerity must long be our watchword and password, with hope for inspiration, and gratitude for opportunity.

TEXAS DENTAL HEALTH WEEK

For all dental health week in Texas is a thing of the past, the results are still permeating the fertile soil of the public health field, and communities and individuals are more interested in dental health than ever before. The campaign on which the Council on Mouth Hygiene and Public Instruction of the state dental society spent about $200 was so successful that plans for next year's health week have already been made. Other state societies will undoubtedly gain many ideas from the following outline of the program and report sent to us from Texas.

OUTLINE OF PROGRAM FOR CONDUCTING "DENTAL HEALTH WEEK" AS SUGGESTED BY THE COUNCIL ON MOUTH HYGIENE AND PUBLIC INSTRUCTION OF THE TEXAS STATE DENTAL SOCIETY

Introductory.

The purpose of "Dental Health Week" is to present clearly and forcefully to all the people of Texas the essential truths of how to grow strong healthy teeth in clean healthy mouths, and how to keep them healthy; the very important reasons why it should be done, and the far-reaching results of failure to do so. This effort is being put forth purely as an educational health measure for the state. The ethical dental profession, in each community, is hereby urged to take active steps and render every assistance possible in putting on and carrying out these plans.

The channels through which the public will be reached are: publicity through the newspapers, professional and educational journals, and the department of education and the department of health of the state; and also school and community programs.

Publicity.

All publicity possible should be given in each community through the newspapers by publishing this program; also by having articles run for several weeks ahead dealing with *teeth* and *health*, and by carrying daily notices of all activities for the week.

Cooperation of all local school authorities should be secured.

Announcements from the pulpit of all activities for the week, and the preaching of sermons on health subjects, should be arranged for.

Radio talks will be given each evening of the week, Monday to Friday, on dental health subjects, supplied or approved by members of the Council.

School Program.

1. Arrange for special talks to all grades in school on "Foods that Produce Good Teeth" and "How Teeth Should be Cared for to be Preserved, and their Supporting Tissues Kept Healthy." The speakers should be dentists, physicians, teachers, or nurses.

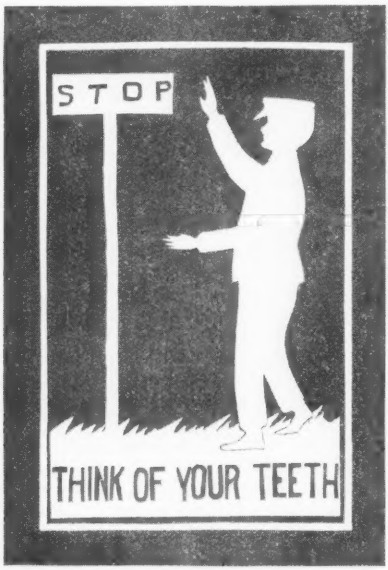
2. Conduct essay contests on "How to Grow Strong, Healthy, Regular Teeth and How to Keep Them," prizes to be arranged for by local dentists, to be given by parent-teacher clubs, Rotary, Kiwanis, Lions, civic clubs or other local organizations. The judges should be representatives of the schools; dentists, and organizations awarding prizes. Contests are to be conducted in any schools, but limited to the fifth, sixth and seventh grades.

3. Conduct contest on dental and health

posters as part of drawing and art lessons, on conditions noted above.

4. Conduct contest for best kept, healthiest mouths and most perfect teeth to be found among school children, on examination by dentists, ages or grades to be determined locally.

In all contests, there should be first, second, and third prizes, with honorable mentions.



Prize winning poster.

Community Program.

1. Arrange with luncheon clubs and similar organizations to have dental talks on "Preventive Dentistry."

2. Where possible, have community mass meetings, under supervision of parent-teacher clubs, directed by teachers and nurses, giving health playlets, songs, toothbrush drills, etc. Addresses should also be made by physicians and dentists on the diet and health phases of dentistry.

3. Have dentist give talks before mothers' clubs and other organizations on "The Care of Small Children's Mouths to Preserve the Six-Year Molars."

4. Have stickers made to be placed on automobile windshields, and cards to be placed in street cars and show windows of stores with the slogan,

"Dental Health Week,
(Dates)
Save your teeth."

5. Have drug stores make window display of toothbrushes and dentifrices, with posters dealing with dental health. Posters made by school children can be used in the windows.

6. Have grocery stores make window display of foods that build strong teeth. Here again the posters may be used to advantage.

7. Have motion picture house and theaters show five or more slides, with crisp truths on preventive dentistry. These slides can be made or purchased.

Much valuable educational material, in the way of slides, films, motion pictures, bulletins, stories, songs, plays, posters, and reprints of articles helpful in putting on this program can be secured promptly from the Department of Dental Health Education, as per printed list in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, October, 1924. The bulletins of the American Academy of Periodontology should be placed in the hands of all school teachers.

The state department of education, through the superintendent, S. M. N. Marrs, and the Texas State Board of Health, through the state health officer, Dr. H. O. Sappington, are cooperating in this move. On request the latter office can furnish Bulletin No. 3, "The Care of the Teeth," and a few reprints. There is also available the motion picture reel.

The Council can furnish copies of articles for newspapers on dental health subjects and will be glad to lend every aid possible. Suggestions for talks before schools and clubs will be furnished on request.

The first prize essays from each community should be sent to Dr. Trim Houston, Corsicana, for comparison by the Council, after which a prize, or prizes, amounting to $25.00 will be given for the best. Announcement of the winners will be made through the press at the state dental society meeting, San Antonio, May 19-22.

The first prize posters from each community should be sent to Dr. C. E. Stephens, Gibbs Bldg., San Antonio, for exhibit at the state dental meeting, where they will be judged, and the winners announced through the press.

These suggestions are to be used as a guide for uniformity in carrying out the purpose of this effort. They can be used in part or in whole, altered and improved or supplemented according to the wishes in each community. Any and all activities

Poster displayed in store windows.

carried on in the state, as a part of the program for "Dental Health Week," should be reported promptly and fully to the chairman of the council, that a complete report can be made to the state dental society meeting in May.

W. O. TALBOT, *Chairman.*
F. & M. Bank Bldg., Fort Worth.
C. E. STEPHENS, Rural Work.
Gibbs Bldg., San Antonio.
W. H. SCHERER, Civic Work.
Scanlan Bldg., Houston
W. P. DELAFIELD, Industrial Work.
Medical Arts Bldg., Dallas.
TRIM HOUSTON, School Work.
Corsicana.

Council of Mouth Hygiene and Public Instruction.

REPORT OF THE COUNCIL ON MOUTH HYGIENE AND PUBLIC INSTRUCTION, OF THE TEXAS STATE DENTAL SOCIETY

To the House of Delegates of the Texas State Dental Society:

Your Council on Houth Hygiene and Public Instruction wishes to report that it was created by an act of the house of delegates in September, 1924, and that its members were appointed by the president, to serve from one to five years.

The purpose of this council is indicated by its name, and its work is planned along the lines of like committees in other states, to be operated in harmony and cooperation with them and with the council of the same name in the American Dental Association, at whose suggestion this action was taken.

The work is divided under four heads, with a director for each. The assignments are as follows:

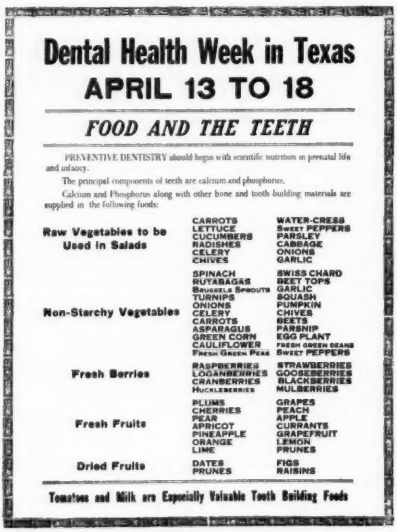
School Work	Trim Houston, 1 year
Industrial Work	W. P. Delafield, 2 years
Civic Work	W. H. Scherer, 3 years
Rural Work	C. E. Stephens, 4 years
Chairman	W. O. Talbot, 5 years

The council was late in getting organized, and about the middle of January, we made inquiry of the chairman of the Council on Mouth Hygiene and Public Instruction of the American Dental Association for suggestions on work that was being accomplished in other states. We received a copy of a report on preventive dental clinic week put on in Minneapolis in the fall of 1923, which was a great success. This gave us the idea on which the committee agreed and furnished the foundation on which we immediately began work, with the view of putting on a dental health week covering the entire State of Texas.

The psychologic moment was here. Following so closely on the meeting of the American Dental Association in Dallas, last November, with the wide and full publicity given it all over Texas by the press and the professions, of what that meeting was and what it stood for in the matter of health to all the people, it was the most opportune time to call the attention of the public to the subject of a dental health week and the fact that a permanent committee had been formed in the state dental society whose business it shall be to watch after the teaching of mouth hygiene to the public in the State of Texas.

Accordingly, the fourteen local and district dental societies were sounded as to their interest and cooperation in such an undertaking. The response was favorable and in many cases enthusiastic. The leading newspapers of the state were asked for their assistance, and we were accorded their full support, also that of the *Texas State Dental Journal.*

As our program was being prepared, we received copies of the program prepared for dental health week in Pennsylvania, together



Dental Health Week in Texas
APRIL 13 TO 18

FOOD AND THE TEETH

PREVENTIVE DENTISTRY should begin with scientific nutrition in prenatal life and infancy.

The principal components of teeth are calcium and phosphorus.

Calcium and Phosphorus along with other bone and tooth building materials are supplied in the following foods:

Raw Vegetables to be Used in Salads	CARROTS LETTUCE CUCUMBERS RADISHES CELERY CHIVES	WATER-CRESS SWEET PEPPERS PARSLEY CABBAGE ONIONS GARLIC
Non-Starchy Vegetables	SPINACH RUTABAGAS BRUSSELS SPROUTS TURNIPS ONIONS CELERY CARROTS ASPARAGUS GREEN CORN CAULIFLOWER FRESH GREEN PEAS	SWISS CHARD BEET TOPS GARLIC SQUASH PUMPKIN CHIVES BEETS PARSNIP EGG PLANT FRESH GREEN BEANS SWEET PEPPERS
Fresh Berries	RASPBERRIES LOGANBERRIES CRANBERRIES HUCKLEBERRIES	STRAWBERRIES GOOSEBERRIES BLACKBERRIES MULBERRIES
Fresh Fruits	PLUMS CHERRIES PEAR APRICOT PINEAPPLE ORANGE LIME	GRAPES PEACH APPLE CURRANTS GRAPEFRUIT LEMON PRUNES
Dried Fruits	DATES PRUNES	FIGS RAISINS

Tomatoes and Milk are Especially Valuable Tooth Building Foods

Poster displayed in store windows.

with copies of addresses sent out by C. J. Hollister, the director in that state, for use before schools, clubs, and parent-teacher associations. Many suggestions in that program were most helpful to us, and the addresses were used most freely in supplying the demands for literature of that nature.

We are indebted to Dr. Hollister for the use of that material, which enabled us to supply the demand and put the move over in so short a time. A copy of the suggested program was published in the *Texas State Dental Journal* and some of the daily papers, and copies were mailed to the officers of all local societies and to many others who asked for them before they received their copy of the Journal.

Our plans were made known to the state health department through our state health officer, H. O. Sappington, who furnished us valuable assistance through the field officers and nurses in that department, to each of whom a copy of the program was sent, with instructions to cooperate in the move. The correspondence had with the county nurses showed they were alive to the value and importance of such efforts in an attempt to protect and improve the public health.

The state department of education, through the superintendent, S. M. N. Marrs, rendered valuable aid by suggestions to the public schools of the state, through which channel, under the local school authorities and teachers, the greater number of people were reached and the greatest good was accomplished. It was at the suggestion of Mr. Marrs that the original date was changed from the first week in May to April 13-18, as many of the schools of the state close by May 1.

The extension department of the state university helped the cause by supplying many pamphlets and literature to those applying for them. This department assures us they will be better prepared to meet the demands for aid another year.

We are fortunate in having a Department of Dental Health Education of the American Dental Association, which supplied the demands for a large amount of educational material, posters, picturol machines, and many sets of slides for motion picture houses.

The general interest shown by the people of the state, the willingness of the newspapers to cooperate and the work done by the dental profession and the nurses in their respective communities, together with the splendid interest and cooperation in the schools in carrying out the program, which was manifested largely in the essay and poster contest, was all most gratifying and encouraging to your committee and serves as an indication of the good that may be accomplished if this line of work is followed up.

The prize winning essays and posters from the many cities, towns and community schools of the state have been sent in to the council in the state contest, and prizes will be awarded them. These essays and posters are on exhibit at this meeting, and the membership is urged to take time to examine them.

Extending mouth hygiene through the work of the graduate nurse appears to the council a most practical and easy method by which much good may be accomplished.

Whenever a nurse is needed, mouth hygiene is especially needed. A competent dentist or a specially trained nurse for teaching such work on the faculty of every training school for nurses would extend and enhance the value of the services of the latter.

A practical course of instruction for the graduate nurse in the inspection of children's mouths and the teaching of mouth hygiene in the schools would be a valuable aid to the school nurses and enable them to cover a broader field by aiding the school dentist in his work, or rendering a like service to the children in schools where dentists are not employed.

If it is the wish of the society that the work of the council be extended into this field, it will be undertaken.

Another avenue that is open to improvement, should be covered by some department of this society, and could properly be undertaken by the director of civic work of the council, is that of providing units for dental services in the hospitals of the state. There are only a few hospitals in the state at present that are properly equipped for a dentist to render satisfactory service of any kind to his patient. Some improvement may be made in the older hospitals, and much could be done in providing better accommodations in the new ones being built if attention were called to the matter in time. Such work could be undertaken only in an advisory capacity at the invitation or with the consent of the local dentists. This matter can be taken up by the council if the society desires.

On examination of "Advanced Physiology and Hygiene," by Conn and Buddington, now being taught in the public schools of the state, it is found that considerable space and material is devoted to the mouth, dealing with the mucous membrane, the tongue, the palate, the teeth and their function and care, but there is nothing given about the gums and the periodontal membrane, nor their care. In fact, a gross error is committed in the following statement, "This cement covers the roots and connects the teeth firmly with their sockets in the jaw bone. It is this substance which yields when a tooth is extracted." This error should be corrected. It will be called to the attention of the state superintendent and the text board. An effort will also be made to have proper and correct information on the gums and supporting tissues of the teeth and their care inserted in the next physiology adopted in the state.

Respectfully submitted,

Committee on Mouth Hygiene and Public Instruction.

W. O. TALBOT, *Chairman.*

April 19, 1925.

DENTAL HYGIENE AT BLOOMINGDALE HOSPITAL FOR MENTAL DISEASES

By HELEN R. DONEHUE, D.H., White Plains, New York

(Read before the Dental Hygienists' Association of the state of New York, May 16, 1925)

BLOOMINGDALE Hospital, which is located at White Plains, New York, is conducted by the Society of the New York Hospital as a department for the treatment of persons suffering from nervous and mental disorders. It is a private institution, receiving no support from public funds.

The hospital accommodates about 300 patients, both men and women, the number of women being slightly the greater. For several years, chronic cases have not been received for treatment, and the service is therefore, rather active. Last year, 267 patients were admitted and 272 discharged. Of those discharged, 20 per cent had recovered and 40 per cent were improved.

The progress made in the dental care of these cases has corresponded more or less with the progress of general psychiatric treatment.

Dr. D. A. Sniffen, the dentist, has been in regular attendance for the past twenty-six years. He started with a service of two half days a week and gradually increased his hours until, four years ago, the need was so great that he began giving his entire time to the hospital.

Much more attention has been paid to the teeth during the past few years because of advancement of the theory that focal infection in various parts of the body and particularly in the mouth has a direct relation to mental disorders. It has always been the policy of Bloomingdale Hospital to be very conservative in statements or claims regarding the relationship of focal infection to mental disorders. The experience of several years careful observations have justified this conservative attitude. While it is obvious that the physical health of mentally sick patients is very important and should receive first attention, it has been found that such foci of infection as occur in the mouth seldom have a specific or very important relationship to the cause or treatment of mental disorders. However, as improvement in the mental condition often follows improvement in the general physical condition, every effort is made to improve the latter as much as possible, and this, of course, includes the care of the mouth. In order to provide adequate care of the patients in this hospital, it is necessary for the dentist to spend most of his time attending to the reparative work. Since 1921, he has been assisted in the oral hygiene by a dental hygienist. In an effort to give the best attention to the teeth of these patients, all teeth have been routinely examined by roentgen ray since the summer of 1921.

The value of the service rendered by the dental hygienist to the community at large is generally recognized; and it requires little imagination to appreciate the fact that persons who are mentally disordered require as much service of this kind, and even more, because they are unable, because of their condition, to care for their mouths as well as can those who are of normal mentality. Some patients are exhilarated, excitable, flighty, carefree and more or less unconcerned about the care of the mouth. Some are depressed, slow in their movements, and without interest in living, or so preoccupied with morbid thoughts and feelings that they are unable to attend properly to the hygiene of the mouth.

It has been my experience that those patients who are depressed require more frequent attention than those who are exhilarated and active because of the fact that they accumulate tartar more quickly than do other patients. Just why this is so, I am unable to say. It may be that their depression and the increased difficulty which they meet in their physical activities lead them to give less attention to their mouths than they would otherwise. It is possible also that there may be a change in the secretions that ordinarily bathe the mouth. I have observed that the amount of saliva secreted in the depressed patients is less than in other types.

We have some patients who are confused, fearful and subject to hallucinations and delusions, all of which make it very difficult for them to care for themselves properly. Still others have become demented or have deteriorated mentally; that is, they have lost the mental capacity to appreciate the need of care of their physical condition. As the nurses are unable to do more

than see that such patients brush their teeth, the oral hygiene of many soon becomes nothing more than perfunctory tooth brushing or no brushing at all, and as a result the teeth and gums are liable to get in bad condition more rapidly than would ordinarily be the case. The dentist is unable to give proper attention to the oral hygiene of these patients because his time is occupied with the roentgenographic diagnosis and surgical and reparative work.

When these facts were presented to those in charge of the hospital, the urgent need of the service of a dental hygienist was immediately recognized. This service is now regarded by the hospital as indispensable.

When a dental hygienist was first employed at Bloomingdale Hospital, she worked with practically no equipment and in the same office with the dentist. The room was small and the operators were more or less handicapped by lack of space. In 1923 a new dental department was installed consisting of a reception hall, waiting room, private office, dentist's operating room, dental hygienist's operating room and laboratory, beautifully furnished and equipped with the most modern dental equipment. Since then, it has been possible to work more efficiently, and the quality of work done has been definitely improved. A thorough prophylactic cleaning and examination is given each patient as soon as possible after admission. This is repeated for all at least twice a year and more frequently for those who require the special attention of the hygienist. Appointments are made to see certain patients each day. Most of these patients come to the office and are accompanied to and from the wards by the dental hygienist. In those few instances in which the patient may not be sufficiently cooperative, a nurse assists in bringing him to and from the hygienist's office and is present throughout the treatment.

I have had no particular difficulty at any time in attending to these patients, and their cooperation in the work is practically equivalent to that of the general public. Of course, some patients who are talkative, excitable or distractable require a calm, conservative attitude on the part of the dental hygienist. Those who are apprehensive may require assurance; and those who are much retarded in their thought processes may need stimulation sufficient to elicit their cooperation.

Because of the relatively large number who are depressed and therefore likely to be suicidal, it is necessary to keep instruments, etc., constantly under observation and at a sufficient distance from the patients so that they will be unable to harm themselves. A few require special attention because of a desire to escape, but the patients who give the dental hygienist most concern are those who are liable at any moment to seek an opportunity to do themselves bodily harm.

Those who have not had experience with the mentally sick might have some aversion to working in a hospital of this kind or with such patients. This, of course, is a quite natural feeling because of the superstitions and misunderstandings of the general public in regard to this branch of medical practice. I must confess that, in the beginning, I had no special desire to work with this type of patient, but I soon found that such work was fascinating, not only because of the dental hygiene work itself, but also because

of the opportunity to study the various types of abnormal human behavior.

In time, I was able to observe that this behavior was not something strange or entirely dissociated from that observed among normal individuals, but was largely an exaggeration of that of every normal person. Many of the deviations from normal were so slight that a casual observer would not suspect that there was any abnormality. I have found this opportunity to observe abnormal human behavior interesting and valuable. It has given me, and would give anyone, I am sure, a better understanding of normal people and also of those individuals who are commonly regarded as eccentric. In short, it has given me a much broader outlook on life.

DENTAL SLOGANS

Many manufacturers either stamp a health message on the pay envelops of their employes, or enclose a slip bearing a message. In reply to several requests from dentists who have been asked to contribute dental slogans, the following are given. Each may be used as an attention attractor, with an explanation below.

A clean, healthy mouth is good life insurance.

A toothbrush is a better friend than a toothache.

Be both "choosey" and "chewsy" about your eating.

Eat means masticate.

The material for building your teeth is provided by the food you eat.

Choose your food wisely and chew your food well.

Be true to your teeth or they will be false to you.

There are thirty-two reasons why every member of every family should have a toothbrush; every reason is a tooth.

Fill your candy basket with fruit.

Whose teeth will you be wearing when you are 40?

Many people are digging their graves with their teeth.

The best tooth powder or tooth paste is elbow grease.

Be selfish about your toothbrush. It is yours only.

See your mouth as others see it.

Chew your food: your stomach has no teeth.

An unhealthy mouth neglected never gets better.

Keep well teeth well.

Apples are called "Nature's toothbrush."

End each meal with a self-cleansing food—apple, celery, lettuce, etc.

Make the dentist's office a service station, not a repair shop.

Don't "eat with your eyes."

If a tooth could talk, it would surely say, "I need to be cleaned four times a day."

An ounce of brushing is worth a pound of promises.

It is cheaper to prevent decay than to check it.

The best way to cure a disease is to prevent it.

A brush in the mouth is worth two on the shelf.

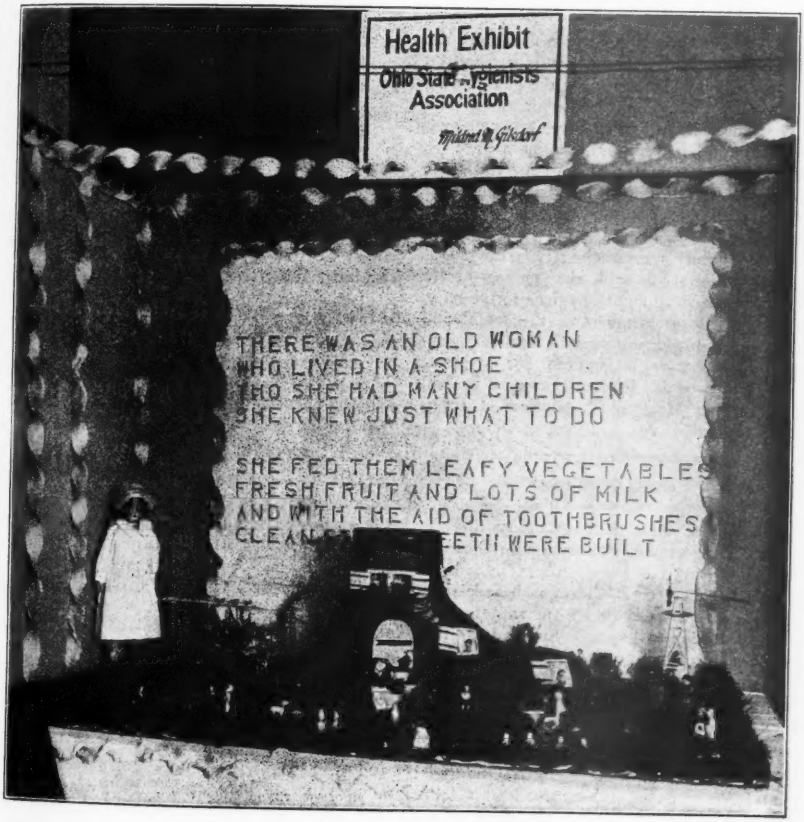
I would rather put a dirty fork into my mouth three times a day than have thirty-two dirty teeth in it all the time.

A tooth in the mouth is worth ten on a plate.

"THE OLD WOMAN IN THE SHOE"

The mouth hygiene exhibit of the Ohio State Dental Hygienists' Association, entitled "The Old Woman in the Shoe," was presented at the annual session of the American Dental Association, at Louisville, Ky., September 21-25. The theme of the entire outlay is very clearly expressed by its accompanying jingle—

There was an old woman
Who lived in a shoe,
Tho she had many children
She knew just what to do.
She fed them leafy vegetables,
Fresh fruit, and lots of milk,
And with the aid of toothbrushes
Clean, strong teeth were built.


Health Exhibit
Ohio State Hygienists
Association
THERE WAS AN OLD WOMAN
WHO LIVED IN A SHOE
THO SHE HAD MANY CHILDREN
SHE KNEW JUST WHAT TO DO
SHE FED THEM LEAFY VEGETABLES
FRESH FRUIT AND LOTS OF MILK
AND WITH THE AID OF TOOTHBRUSHES

In this exhibit, the Old Woman, although forced by necessity to live in a shoe, does not lose sight of the fact that cleanliness is next to Godliness and that the fundamental principles of diet and exercise must be observed for good health. Evidence of her ideals and motherly guidance are clearly illustrated by the activities of her thirty children, who are seen climbing over the large "Shoe House,"

crawling through the windows and romping through the yard. Some are swimming, some are returning with a wagon load of toothpaste, while others are in the side yard by the old windmill pump brushing their teeth. The Old Woman herself carries in her hand a basket full of toothbrushes.

The house, even though it is made of a shoe, is most inviting, and one feels a desire to stop for a look, if not for a chat with the thrifty housewife. Perhaps it is the artistic gardens which surround it, or the gay colored flowers blooming in profusion or the attractive window boxes which give it the "homelike" atmosphere, but—the twins forgot to draw the shades in the bath room, and there they are—one brushing her teeth and the other taking her bath—in full view of the entire audience.

This exhibit is most cleverly arranged as visual material to aid the public health worker in teaching mouth hygiene to the laity. It is available to members of the dental and the medical profession and to health organizations, and may be secured for a rental of $3.00 per day. Information may be had by addressing Mildred M. Gilsdorf, Citizens National Bank Bldg., Chillicothe, Ohio.

FIELD NOTES*

The Illinois State Dental Society through its Oral Hygiene and Public Service Committee is arranging for a series of radio talks to be given over two Chicago broadcasting stations twice a week during the winter. Such a demonstration will prove to the laity that the dental profession is awake to its duty and will strengthen its position in the minds of the public. The Illinois State Dental Society is to be congratulated on setting an example which others would do well to follow.

The National Association of Industrial Dental Surgeons each month sends a letter by one of its members to all members of the Association, telling about the work carried on in his company; wherein he has failed, and what he hopes to accomplish. The November letter was written by Ira Dow Beebe of Yale and Towne Manufacturing Company, Stamford, Conn. Dr. Beebe writes that the Yale and Towne Clinic, established six years ago, is equipped with two chairs and has a staff consisting of a dentist and a dental hygienist. Emergency work, examinations and diagnosis are free of charge, while a nominal fee is made for plastic fillings and prophylactic cleanings. All employes have a cursory examination. Attendance at the chair is voluntary. Approximately 35 per cent of all employes avail themselves of the privileges of the clinic. The house organ, *The Panel*, publishes articles discussing the work of the clinic, distributes information with the pay envelops and gives new employes dental information printed in three languages. Dr. Beebe has written a series of monthly letters to the salesmen, which go out through official channels and which emphasize the importance of dental health. Samples of the educational material will be sent on request addressed to Dr. Beebe.

Indianapolis has recently built a new wing and added a new surgery department to the City Hospital. In the latter, two rooms were set aside to be equipped as a dental clinic. At a recent meeting of the Indianapolis Dental Society, it was voted that the Society completely equip the new dental department at the City Hospital.

*The Department of Dental Health Education will be glad to receive items of news along the lines of education in dental or general health.

$0.29 FOR HEALTH

You and every other average American spent $10 for candy last year, statistics show; and $9 for education; and $3.50 for police and fire protection; and $0.75 for perfumery; and $0.50 even for chewing gum. But per capita expenditure for health was a mere $0.29. If we can afford to spend $10 per year for candy and gum, why not an equal amount at least for health?

Medical and Dental News

Arkansas

School Dental Survey: In a recent survey of school children's teeth in Pine Bluff, the following percentages of defects were found in the various schools: 77, 80, 81, 84, 85 and 88. On the whole, conditions are improved over those revealed in the survey conducted six years ago. The following dentists contributed their services for the work: C. U. Mayfield, E. A. Payne, J. W. Stephens, E. H. Johnson, S. G. Jones and J. C. O'Daniels. Among the 1,612 children examined the following defects were found: caries in temporary teeth, 1,828 cases; in permanent, 1,870; temporary teeth to be extracted, 857; permanent, 16; in need of prophylaxis, 1,431; needing orthodontic treatment, 37; number having good teeth, 287; needing treatment, 398.

Connecticut

Stafford Dental Clinic: A clinic is being held in Stafford, under the direction of Drs. H. B. Wright and C. B. Tschumini, to determine the condition of the teeth of children attending the local schools. Instructions in the care of the teeth will be given, and a record of the condition of the teeth will be kept in each case, and recommendations be made to the parents as to work needed.

Idaho

Southwest Idaho Dentists Elect Officers: At a meeting held December 1, at Caldwell, the Southwest Idaho Dentist's Association elected the following officers: president, Robert J. McCabe, Nampa; secretary, R. A. Johnson, Nampa; treasurer, E. E. Dutton, Caldwell.

Illinois

Dr. Bundesen Addresses Dentists: Dr. Herman N. Bundesen, head of the department of health of the City of Chicago, addressed the Kenwood-Hyde Park Dental Society, December 1, on "Building a Firm Foundation." Before the meeting, to which the medical profession was also invited, a dinner was given.

Indiana

Dr. Bloodgood Addresses Medical-Dental Meeting: Dr. Joseph Colt Bloodgood, cancer specialist, and member of the staff of Johns Hopkins University, was the principal speaker at a joint meeting of the Vanderburg County Medical and Dental societies, December 4, at Evansville. About four hundred physicians, surgeons and dentists, were in attendance. A banquet preceded the meeting, at which Dr. W. J. Hooker, Newburg, president of the Vanderburg County Dental Society, presided, with Dr. Horter H. Linthicum toastmaster.

Lake County Dental Society Plans Rural Work: At its monthly meeting, following a banquet, business session and address by Dr. J. R. Blayney, of the Illinois College of Dental Surgery, the Lake County Dental Society formulated a plan by which each dentist in the association is to take over the work of examining the children in two rural schools. They will also give instruction in mouth hygiene.

Iowa

Free Dental Clinic for Preschool Child: A free dental clinic for the preschool child was held in Dubuque, December 8-19, under the auspices of the extension division of the state university, with the city and county health departments cooperating. Dr. George H. Wandel, of Iowa City, had charge of the work. The clinic was purely educational. Care of the teeth was discussed at mothers' meetings and before men's clubs.

Minnesota

Mr. Sutton Addresses Minneapolis District Dental Society: Mr. Willis A. Sutton, superintendent of the schools of Atlanta, Ga., gave

an address before the Minneapolis District Dental Society on "Saving Millions and Preserving Life Through Oral Hygiene." A luncheon, at which health workers and members of parent-teacher associations throughout the city, preceded the lecture.

New Jersey

Medical Instruction by Radio: The Medical Society of New Jersey is broadcasting from Station WHAR, Atlantic City, as part of its program of public education "Ten Minute Talks on Keeping Well" Thursday evenings, 7:30, and is distributing copies of these talks to 150 newspapers of the state. The program, which began, October 22, comprises the following subjects: (1) "The Medical Society of New Jersey—Its Relationship to the Community"; (2) "Periodic Health Examination—What Does It Mean?"; (3) "Am I in Perfect Health?"; (4) "An Ounce of Prevention"; (5) "A Stitch in Time"; (6) "Recovering Lost Ground"; (7) "Keeping Fit"; (8) "How to Avoid Infectious Diseases"; (9) "Focal Infections—How They Menace Health and Life"; (10) "Teeth and Tonsils—What to do About Them."—*J.A.M.A.*, Nov. 21, 1925.

Mouth Hygiene Campaign: The Dental Societies of Essex County are laying plans for a mouth hygiene campaign, beginning May 1, 1926. Lectures are being arranged for, statistics gathered among school children, cooperation of dentists solicited, exhibits planned and posters designed. Dr. Abraham Wolfson of East Orange is in charge of arrangements.

New York

First District Society Holds Convention: A three-day session of the First District Dental Society of the State of New York opened December 2, at the Hotel Pennsylvania. Progressive and group clinics were given, and oral hygiene posters were displayed by various health groups. The society has 6,000 members.

Ohio

Ohio State Dental Society Meets: The sixtieth annual meeting of the Ohio State Dental Society was held in Columbus, December 1-3. Among those taking part in the program were Polk E. Akers, Chicago, Ill.; Boyd S. Gardner, Rochester, Minn.; Ewell Neil, Nashville, Tenn.; E. C. Rosenow, Rochester, Minn.; Biley Smith, Baltimore, Md.; W. A. Sutton, Atlanta, Ga.; Stanley D. Tylman, Chicago, Ill.; Dana L. Woodworth, Chicago, Ill.; Weston A. Price, Cleveland, Ohio, and J. P. Becker, Cincinnati, Ohio. Wednesday afternoon, the Callahan Award was presented to E. C. Rosenow. The following officers were elected for the coming year: president, J. V. Gentilly, of Cleveland, vice president, Walter J. Hartshorn, of Toledo, secretary, A. O. Ross, Columbus (reelected); treasurer, E. C. Mills, Columbus (reelected).

Harris-Taylor Memorial Tablet Unveiled: A memorial tablet dedicated to the memory of Chapin A. Harris and James Taylor, pioneer dentists, was unveiled at Bainbridge, Ohio, the scene of their early dental activities, November 30. The tablet was presented to the town of Bainbridge by Drs. E. C. and C. W. Mills, of Columbus. The unveiling ceremony was performed by Charles W. Mills, Jr., and Dr. Otto U. King, Chicago, general secretary of the American Dental Association, delivered the unveiling address.

Oklahoma

Series of Clinics Held: A series of dental clinics are being conducted in Blackwell, local dentists cooperating with the public health association. School children are being examined, the clinics being held every week at the public health center and the health nurse cooperating.

Kansas

Work in Leavenworth Rural Schools: As a result of dental inspections conducted over a period of three years, marked improvement of the health of children in the rural schools of Leavenworth has been noted. Dr. D. S. Lewis is in charge of the work.

Virginia

Midwinter Clinic at Medical College of Virginia: A second midwinter clinic sponsored by the Virginia and North Carolina state dental associations and the Medical College of Virginia is scheduled for the second week of January (11-12). Following are the clinicians and their subjects: Partial Denture Restorations, by Polk E. Akers, Chicago, Ill.; Root Canal Work, by U. G. Rickert, Ann Arbor, Mich.; Early Recognition of Departure from Normal Arch Development and Treatment Which May be Offered by the General Practitioner, by Herbert A. Pullen, Buffalo, N. Y., and Periodontia, by W. G. Telford, Toronto, Canada.

WEST VIRGINIA

Wheeling District Dental Society Meets: The annual fall meeting of the Wheeling District Dental Society was held, December 1, at Wheeling, with about fifty members in attendance. Speakers on the afternoon program were Leslie Waddill, A. C. Barclay, H. J. Horner and Dr. Myers, of Pittsburgh, Pa. Dr. Horner, of the University of Pittsburgh, spoke on "Newer Prosthesis," and gave a clinic. A banquet followed the meeting, at which Dr. A. E. Hennen, president of the organization, presided.

WISCONSIN

New Society Organized: The dentists of Lafayette, Green, Grant and Iowa counties met in Darlington, November 28, and perfected the organization of the Southwestern Wisconsin Dental Society as a component of the Wisconsin State Dental Society. W. H. Williams, of Darlington, was elected president and G. W. Newby, Platteville, secretary. Talks were given by M. H. Mortonson of Milwaukee, E. C. Wetzel, of Milwaukee, and R. W. Huegel, of Madison. Clinics were given by H. M. Uebele of Milwaukee and M. H. Mortonson, assisted by N. S. Jensen, of Milwaukee.

Oshkosh Society Meets: The Oshkosh Dental Society was addressed at their regular monthly meeting by Dr. C. C. Norris, who spoke on "Health and Education as Carried on in the Public Schools of Atlanta, Ga."

FOREIGN

German Organizations Affiliated With F. D. I.: The following dental organizations of Germany are affiliated with the International Dental Federation: Central Society of German Dentists (president, Prof. Dr. Walkhoff, Wurzburg; secretary, Dr. O. Köhler, Darmstadt); National Dental Association (president, Dr. Linnert, Nuremberg; general secretary, Dr. Hoffman, Berlin); German Dental Society (president, Dr. A. Scheele, Cassel; secretary, Dr. Blum, Berlin); Association of Dental Teachers of German Universities (president, Prof. Dr. Dieck; secretary, Dr. Konrad Cohn); Dental Society of Prussia (president, Dr. Treuenfels, Breslau); Dental Society of Baden (president, Dr. Hoffman); Dental Society of Bavaria (president and sanitation counselor, Dr. Rotenberger).

German Members of International Dental Federation: The members of the National Committee of Germany of the International Dental Federation are Prof. Dr. Dieck, Berlin, Prof. Dr. Euler, Breslau, Dr. Konrad Cohn, Berlin, Prof. Schaeffer-Stuckert, Frankfort-on-Main, and Dr. A. Scheele, Cassel.

German Dentists Coming to International Congress: The following dentists from Germany have signified their intention to attend the International Dental Congress: Dr. A. Scheele, Cassel; Dr. Otto Loos, Frankfort-on-Main; Dr. Walter Adrion, Berlin; Prof. Dr. Mamlok, Berlin; Dr. Konrad Cohn, Berlin.

GENERAL

Information Regarding International Congress Clinics: Plans for the clinics to be sponsored by the state advisory committees of the Seventh International Dental Congress are as follows: 1. Each state is to contribute twice as many clinics as it will have delegates in the 1926 House of Delegates of the American Dental Association. 2. Those states having more than two clinics under this plan may present one-third of their total in the form of group clinics. 3. Only table clinics will be accepted. No surgical or lecture clinics are to be furnished by the state advisory committees. 4. All state clinics from a state advisory committee must be ratified by a majority vote of the committee or a committee selected for this purpose. 5. Any expenses incident to securing the clinics are to be assumed by the state advisory committees. 6. All clinic programs are to be sent to the Secretary-General of the Congress, Dr. Otto U. King, 58 E. Washington St., Chicago, Ill., not later than March 1, 1926.

Changes at Deaner Institute: Dr. W. H. Jordan, who has been prominently identified with the development and management of the organization since its inception, resigned, Sept. 3, 1925. The board of trustees is composed of the following members: Mr. William Volker, Mr. Andrew Young, Mr. Sigmund Stern, Dr. Lindsay Milne and Judge Joseph A. Guthrie, all of Kansas City, Mo. The administrative council of the staff is composed of Drs. Willis A. Coston, M. M. House and R. L. Haden, Dr. Coston being director of dental diagnosis, Dr. House, general director of the organization, and Dr. Haden having charge of the department of medical research. Dr. John W. Needles of Pueblo, Colo., is soon to become a member of the Deaner staff, in charge of the department of mechanical research.

National Home for Aged and Incapacitated Physicians: Announcement was recently made that a campaign has been started for the purpose of raising funds to endow a national home for aged and incapacitated physicians who are left without financial resources. The sum to be raised has not yet been determined but it is desired to raise an amount sufficient to guarantee the upkeep of the national home proper and several smaller units to be located in different states, these to accommodate a dozen or more residents, and the central home to furnish accommodations for upwards of 1,000.

Examination of Infants: About 10,000 babies were examined physically and mentally at more than seventy baby conferences held at the various fairs this fall, under the auspices of the state health department. The predominating defects found were nutritional—rickets, bowlegs, knocknees, decayed teeth, enlarged heads, flabby muscles and undersize. Each baby was rated on the basis of an examination by specialists.—*Illinois M. J.*, December, 1925.

Nobel Prize Withheld for 1925: As no contributions were deemed of sufficient merit, the Nobel prize awards in literature, medicine and chemistry were withheld for 1925.

Glass Permeable to Ultraviolet Rays: A new kind of glass which has a degree of permeability to ultraviolet and ultrared rays even greater than that of flint glass has been developed by two Austrian chemists, Fritz Pollak and Kurz Ripper. The glass, which has been named "pollopas," is elastic, has a wide refractive range, and can easily be dyed according to scientific standards with dyes adjusted to varying wave lengths. It is about half the weight of window glass, and can be worked on a turner's lathe, filed, polished, and planed. Very little of the new glass is at present on the market.—*Nation's Health, Chicago*, October, 1925.

Army Dental Corps: Maj. Walter S. Smith from duty at Vancouver Barracks, Wash., to Fort Sam Houston, Texas, for duty. Capt. Roy M. Kisner from duty at station hospital Fort Sam Houston, Texas, to Kelly Field, Texas, for duty.—*Army and Navy Register*, Nov. 21, 1925.

Deaths

Beebe, Coldwell Corydon, Hollywood, Calif.; University of Michigan College of Dental Surgery, 1884; died, September 25, aged 68. Dr. Beebe practiced dentistry in Racine, Wis., for thirty-two years, retiring from practicing, and removing to California because of failing health.

Ferguson, B. R., Coldwater, Mich.; died, December 3, after a brief illness.

Herbert, Alfred W., Evanston, Ill.; Chicago College of Dental Surgery, 1888; died, November 27; aged 62. Dr. Herbert practiced in Chicago for twenty-five years, retiring twelve years ago to devote his time to music. He was a singer of ability and gave much of his time to helping young students of music.

Johnson, A. W., Clavert, Ky.; Pennsylvania College of dental Surgery, 1894; died, December 5, while at work in his office; aged 76. Dr. Johnson had been in practice for more than forty-five years.

Kimball, Charles Otis, New York City; for nearly half a century a practicing dentist; died, December 2; aged 80. Dr. Kimball retired from active practice in 1915, owing to ill health. He was at one time president of the New York Dental Society. He held the degree also of doctor of medicine. He is survived by two sons, Cleveland C., a physician, and Charles D., a dentist, and by three daughters.

Reid, John D., Pana, Ill.; Indiana University School of Dentistry, 1897; died, December 1; aged 58.

Rodgers, Shirley Allen, Brooklyn, N. Y.; College of Dental and Oral Surgery of New York, 1911; died, December 2; aged 43.

Swain, Francis M., Kewanee, Ill.; Temple University School of Dentistry, 1885; died, November 30, of cancer; aged 63. Dr. Swain continued his work until three weeks before his death. He was in practice in Stuart, Iowa, for a period of fourteen years, returning to Kewanee in 1900.

Wintraecken, August C., Brooklyn, N. Y.; New York Dental School, 1897; died November 28, after a long illness; aged 49.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Teeth and Eye Relations: The orientation of foci in teeth by other than dental means, Will Walter (*J.A.M.A.*, Nov. 28, 1925) says, has occupied him more than three years. Knowing that the attacks may come from any tooth area, that the infecter is a streptococcus, that the film diagnosis is but one means of orienting it, that the bacteria or their toxic products are coming by the blood stream (though symptoms may appear reflexly), and that the bacteria will grow and be destructive when they find favorable soil, or that the toxins will destroy when bio-chemical conditions favor, we have the problem of defense made evident. In the presence of an eye symptom or a manifest lesion, what, if any, signs are there, apart from those open to observation, that might point the way? A few years ago, Dr. Julius Toren called attention to a blood cell, which he called a specific type of lymphocyte demonstrable by a special type of stainability, which was associated with "teeth" infections—the chronic foci. This cell was differentiated by Ehrlich in his original classification. All that Toren assumed was its association with these infections. Walter sought to ascertain whether he could diagnose "teeth" foci by the presence of these cells. He found them in the beginning, and continued to find them in more than 98 per cent of all blood specimens examined. Therefore, if they are pathognomonic, then teeth infection exists in some form in practically all mouths. It is noteworthy that in cases giving negative blood findings, the mouths have appeared entirely free from infection by all tests. It is also noteworthy and confirmatory of the theory that probably not more than 2 per cent of jaws are free from streptococcus invasion of some sort. Dr. Toren's findings agree with Walter's, who has come to regard 1.5 per cent of these cells as within the normal, but says that any percentage over that should be reduced by procedures directed toward the eradication of suspected infection and continued until the percentage is within normal. Walter has found these cells in a surprisingly high percentage and in an unusual number of adolescents; and this finding, coming at the time of eruption of the third molars, is perhaps significant in view of the assertion by some that the delayed and impacted third molar is always infected. In about one half of the cases, the ratios were changed by the elimination of foci in the way they should be, to be in accord with this theory; the others were not improved by dental surgery. Other variations from normal were found in these cases: first, low white blood counts (relative leukopenia), and second, quite generally, a relative lymphocytosis; i. e., a high proportion of lymphocytes with a lower ratio of what have been thought to be the phagocytes of the blood, the neutrophils. There is, then, some evidence of an association between these infections and the blood response; in other words, a possible evidence of "teeth" infection in the whole blood picture. This, coupled with dental findings, should be a distinct aid to treatment, the object then being to establish a normal ratio by eliminating the areas supposed to be back of these specific cells and cell ratios, and not to give up until we do. Clinical findings, other than the cytologic, which are of added significance and value are: a relatively low blood pressure (hypotension); a low normal pulse and basal metabolism; subnormal temperature, and a low percentage of blood calcium which is perhaps an index of the percentage of other minerals in the blood. Walter gives a long list of eye conditions that he has found to be associated with "teeth" infection and details the management of these cases. He says that, unfortunately, from the standpoint of the eyes, the patients come only after the damage has been done.

Present Status of Dental Foci of Infection: Periodically the professions are carried away by some fad. We get to seeing one thing and see it so hard that it shuts out the vision for all other things. Nothing but the bitter ex-

perience of our patients stops these fads and brings the practitioners to their senses. This is one reason why the fad of extracting as a cure for every disease is passing away. All mouths are infected, but not all people develop manifest lesions from such infections. If a tooth cannot be cured of its infection it should come out, but every pulpless tooth is not an infected tooth by a long ways, and many infected teeth can be treated successfully. Goodman (*Journal Lancet*, Oct. 15, 1925) does not believe that a tooth once infected is always infected; nor that even one-half the ailments which are attributed to pulpless teeth are due to them. It is being proved every day in the practices of careful men, that a very considerable number of teeth which are both periapically and periodontally infected can be cured and will heal in the same manner and to the same degree that infections in other parts of the body are healed. Recent statements by leaders of both professions, sounding a note of warning, would indicate that our ideas of focal infection are changing. Prominent physicians and surgeons have rightfully spoken a warning to the medical profession as to the unfavorable reaction, on the part of their patients, which is almost certain to follow reckless and ill-considered sacrifice of the teeth.—*Am. J. Surg.*, November, 1925.

Diathermy in Stomatology: Budd C. Corbus (*J.A.M.A.*, Nov. 21, 1925) states that diathermy is absolutely bloodless if a flat or blunt electrode is employed, which, if properly used, insures not only destruction of the mass but also sufficient coagulation of the tissues in the immediate neighborhood to minimize the possibility of cell implantation. Vascular structures situated in the near vicinity are sealed, thereby lessening the absorption of infection. Consequently, a shorter convalescence is insured. On account of the absence of any extensive cutting procedure, postoperative shock is minimized, and this is of great value in operating on patients of advanced years. Lastly, and most important of all, is the density and extent of the scar tissue that results after the employment of diathermy in treating malignant disease. The body defense against carcinoma metatasis lies in the formation of the connective tissue capsule. The scar tissue that is formed after a diathermy "burn" is more dense and spreads farther into the surrounding tissue than is the case after any cutting operation; therefore, we have an extensive reinforcement of Nature's attempt to throttle the embryonal cell.

Blood Chemistry: Inorganic Phosphorus. The normal runs from 3.7 to 5 mg. per hundred cubic centimeters. Phosphorus is increased in fractures and in nephritis, especially advanced interstitial and acute nephritis. All cases of acute and advanced interstitial nephritis have an acid phosphate acidosis, which may be quite severe as the ketone acidosis of diabetes, in fact this is the usual cause of death in these cases. The acidosis of infantile diarrhea appears also to be due to acid phosphates. This form of acidosis responds to alkalies just as well as ketone acidosis. Phosphorus is reduced in rickets, in which disease the phosphate values run from 2 to 3.7. Simple ingestion of phosphorus compounds will not raise the blood phosphorus in rickets. There is required in addition and simultaneously with the phosphates and calcium the unknown vitamin "D" which is activated by the ultraviolet ray and found in cod-liver oil or other oils or foods previously irradiated by the ultraviolet ray. *Calcium*: The average blood calcium runs in the adults 9 to 10.5, while in growing children it is higher—10.5 to 11.5. Calcium constitutes about 1/50 of the body weight and its functions have to do with the growth of bone and the clotting of blood and has something to do with maintaining the proper degree of sensitiveness of the nerves. Its study is therefore of prime importance. Although it is commonly understood that in rickets there is a calcium catabolism, physiological chemists have failed to substantiate this claim, for calcium is usually within the normal range. They have rather, as already stated, found a deficiency of inorganic phosphorus. It is likely that the lack of phosphorus and the vitamin principle prevents the deposit of calcium in the bones. There appears to be some relation between increasing irritability of the neuromuscular mechanism (the essential phenomenon of tetany) and low blood calcium, for calcium is diminished in parathyroid tetany and in infantile tetany. According to Scott, the tetany which occurs in advanced cases of sprue seems to indicate interference with the parathyroid function, for amelioration and cure follow administration of calcium with parathyroid extract. In fact, all cases of tetany of whatever kind are benefited by calcium administration. Calcium is in-

creased in: pathologic fractures, osteomalacia and Paget's disease. It is low in: nephritis, otosclerosis, purpura hemorrhagica and jaundice, and in individuals with increased coagulation time. The study of the blood calcium is new and promises interesting developments along the lines of tetany, hypertonia and other forms of nerve irritation as well as diseases with bone involvement. Taken as a whole, then, blood chemistry has opened up a very promising field of laboratory aids in diagnosis and treatment. I, therefore, urge physicians to familiarize themselves with its present value and to be prepared for the advances in the future.—B. W. Rhamy, *J. Indiana State M. A.*, November 15, 1925.

Death Due to Air Embolism: The *New Zealand Dental Journal* reports a case of death due to air embolism in a girl, aged 17, after the extraction of four teeth. The mouth was in a very septic condition, and the roots of the offending teeth were infected with pyorrhea. The patient was under-developed, and perhaps was not in the best physical condition, as she had undergone an operation for appendicitis two months previously. Nitrous oxid was employed for the extraction, and the patient took the anesthetic well. Collapse and death occurred shortly after the operation. It was agreed that the air entered the circulation through a tooth socket, and the two physicians called in by the dentist emphasized at the inquest the fact that the most likely time for the air to enter the circulation was during an operation round the root of the neck or when an intravenous injection was given, the risk being always present. The verdict exonerated the dentist from the charge of negligence.

Protein Reactions in Epilepsy: Protein sensitization reactions in epilepsy taken in connection with studies by J. Francis Wood *et al.* at Craig Colony at Sonyea, N. Y., showed oat protein to be the chief offender, with 20 per cent positive reactions, and lactalbumin a close second, with 15 per cent. Cauliflower was the irritating substance in 10 per cent of positive reactors. Positive reactions were obtained in 40 per cent of females. The offending proteins here were tea in 20 per cent; cow's milk in 10 per cent; cheese, cantaloupe, and tomato each 7.5 per cent. It is emphasized that no final conclusions are warranted from the results reported, but therapeutic effort is being undertaken in two channels: (1) removing offending protein from the diet; or (2) desensitizing the patient. The authors claim that the study brings out the extreme importance of recognizing the hypersensitive state in infancy and childhood and urge that every case of infantile convulsion be fully investigated to see if some offending protein is responsible for the seizure. Thus they hope that certain potential cases of epilepsy be aborted.—*Nation's Health*, October, 1925.

Light and the Antirachitic Factor: As a result of clinical experiment carried out in the Danish State Hospital in an endeavor to compare clinical experiences and observations on the effect of light on different diseases. Block and Faber (*Am. J. Dis. Child.*, October, 1925), draw the following conclusions: 1. Light and particularly ultraviolet rays have a stimulating effect on the organism, which chiefly benefits those functions that are depressed. The curative action of light on rickets and tetany can be explained by such a stimulating effect. It is certain, however, that cod liver oil has the same healing action on rickets and tetany as light has, although the former, in the quantities that can be given to children, acts more slowly and less surely than light. 2. As this effect is not due to the vitamin A substance, there must be a stimulating factor in cod liver oil similar to that in ultraviolet light, in addition to the vitamin A substance. This is easily understood since Alfred F. Hess and Steenbock, Nelson and Black have shown by animal experiments that fats and other food materials, which are without effect on rickets, can be rendered active for experimental rickets merely by exposure to ultraviolet light. Eleanor Margaret Hume and Hannah Henderson Smith (Lister Institute) have shown that exactly the same is the case with sawdust. 3. This proves that the non-specific stimulating factor must be the ultraviolet rays. 4. Evidently the hypothetic antirachitic vitamin does not exist.

Communicable Disease Lesions of Mouth and Throat: The commoner conditions, communicable and otherwise, that the clinician may discover when he examines the buccal pharyngeal cavities are classified by J. W. Hunt (*Oral Health*, October, 1925) as febrile and nonfebrile. Under the former heading are: diphtheria, scarlet fever, measles, smallpox, acute follicular tonsillitis, acute streptococcus infection and Vincent's infection; under the latter, simple ulcer, syphilis, tuberculosis, epithelioma and leukoplakia.

Dental Education and the Public: A. R. McDowell (*Pacific Dent. Gaz.*, September, 1925) summarizes an article on dental education and its relation to the public as follows: 1. The dental schools should establish a well-balanced curriculum to educate their graduates to have a medical point of view as well as the dental. 2. Every endeavor should be made to associate dentistry more closely with medicine in the rendering of public health service. 3. Those schools by reason of their university association, should test out the extreme in dental education; that of two years' college work in addition to fifteen units of accredited high school work for preliminary dental college entrance; placing 1930 as the probable time necessary to test out the efficacy of such a course. 4. Dental education, like all educational pursuits, should be a public charge and receive philanthropic support. 5. University authorities should feel their public responsibility and incorporate the dental schools of the country as an organic part of their university in the service of the commonwealth.

Hematemesis: A Plea for Objective Methods of Diagnosis: Chevalier Jackson, Gabriel Tucker, Louis H. Clerf, Robert M. Lukens and William F. Moore, (*J.A.M.A.*, Sept. 19, 1925) report on the examination of a series of 280 cases which illustrate the well-known errors incident to inferential diagnosis as to the source of blood issuing from the mouth, and how a positive diagnosis can be reached in practically all cases in which the blood comes from the food passages proximally to the pyloric antrum, with all the certainty afforded by direct inspection and, in suitable cases, by biopsy. Vomited blood may come from any part of the air passages, upper or lower, as well as from the food passages. Inferential methods of determining the source of blood in hematemesis are subject to a large percentage of error. Objective examination of all accessible portions of the air and food passages should never be neglected. If examinations of the gums, mouth, nasal chambers, pharynx and larynx are negative and the roentgen ray does not definitely locate a lesion in the stomach, bronchoscopy or esophagoscopy, either or both as may be indicated, should be done to locate the source of the bleeding. Blood on a bougie does not indicate a lesion in the esophagus. It is an inferential, not an objective means, and is useless for the diagnosis as to the source of blood in hematemesis. The bougie can bring blood from normal mucosa. There is much truth in the saying of Trousseau that sooner or later all patients with esophageal stenosis die of the bougie. Blind bouginage for diagnosis is no safer today than in Trousseau's day; nobody can tell where the end of the bougie is going. Esophaoscopy is safe, because the esophagoscopist can see what is ahead of the tube mouth. He advances the tube when he sees a lumen; he does not push it through tissue, normal or abnormal. It is not claimed, however, that a man who has never looked through an esophagoscope before can telegraph for an instrument, do a safe esophagoscopy, and make a certain diagnosis, any more than he could look through a microscope for the first time in his life and make a definite histologic diagnosis. Untrained hands may make a false passage with the esphagoscope as well as with the urethroscope; but the mortality from esophageal trauma is very high as compared to urethral injury. Peptic ulcer of the esophagus is an overlooked cause of hematemesis. It can be diagnosticated in no way other than by esophagoscopy. The cardinal rule in hematemesis with negative roentgen-ray findings should be: Follow the blood to its source by objective methods.

The Child's Teeth: The action of all the muscles attached to the jaws is balanced around them so that the harmony in the development of the face is dependent upon their normal relation to each other in the opposing jaws. If they do not take the normal relation to each other none of the rest of the permanent teeth can do so, the efficiency of mastication is impaired, normal breathing may become impossible, and the harmony of the face is disturbed. It would be impossible to state too strongly the importance of these teeth and the influence of their normal relation on the growth of the individual. Nature seems to have specially provided for the care of the first molars, which are the keystones in the development of a normal "food mill" and a harmonious face. Their formation is begun almost as early as that of the baby teeth and the calcification of their crowns is largely completed before birth. Their crowns and grinding surfaces should be entirely completed in spaces in the bone before the child is weaned. That means that Nature intended to take no chances in supplying the necessary lime in the food to provide for their forma-

tion. They take their places while the baby teeth are still present and working and so they should be guided into normal relation to each other. But the conditions of modern civilization have sadly upset Nature's provisions. Comparatively few babies are breast fed and even those that are very often have serious disturbances of nutrition in the first year, the time during which the calcification of the crowns of these teeth should be finished. As a result there are imperfections in the grinding surfaces of almost all of these teeth; these imperfections furnish the opportunity for beginning decay.—F. B. Noyes, in *Hygeia*, September, 1925.

Anesthetic Properties of Prophylene: As a result of their observations and the observations of others, Halsey, Reynolds and Prout (*Cur. Res. Anes. & Anal.*, August, 1925) present the following conclusions: 1. The preparation of prophylene sufficiently pure for anesthetic use is not unattended with difficulties. All lots of this gas supplied for clinical use should be tested by determination of the boiling point or by biologic assay or by both methods before it is delivered to the anesthetist. 2. Prophylene in laboratory animals induces a nacrosis in concentrations less than one-half of those needed to produce the same effect with ethylene. 3. Death results from concentrations 150 to 160 per cent of those that nacrotize and is usually due to almost simultaneous failure of heart and respiration. 4. In mice, cats and dogs, complete muscular relaxation and abolition of muscular movements cannot be obtained or maintained even by doses close to or equal to lethal ones. 5. In these animals, analgesia sufficient perhaps for clinical purposes may be obtained by concentrations of 40 to 50 per cent and maintained with somewhat lower concentrations. In these concentrations there is no evidence of harmful effect on the circulation or respiration. 6. No late or postponed toxic effects from repeated narcosis have been observed. 7. A long series of carefully observed experiments on animals a limited number of observations on ourselves, considered in connection with the reports from other sources, lead us to hope that this gas may have a value in anesthesia. Clinical trial alone can determine this. 8. Trials on human subjects should be made only cautiously and only by experienced and competent anesthetists. Exactness in dosage is essential to safety. In a footnote, the authors say: "In our hands, one of the most generally approved types of anesthesia apparatus was found to be so unreliable that we were unable to use it in conducting our investigation."

Hypoplastic or Honeycombed Teeth: Every school medical officer of experience has probably noted this serious dental defect, the appearance, occurrence and causes of which are discussed by Millican (*Med. Off.*, May 2, 1925, abstr. *Am. J. Pub. Health*, Sept., 1925) from a study of 5,757 children between the ages of 5 and 14 years. Of this group, 267, or 4.64 per cent showed hypoplastic teeth, the permanent teeth being affected in all but nine of the cases. The defect consists usually of horizontal bands across the tooth surfaces, the enamel of which is either (1) deeply or lightly pitted with brown pits, or (2) altogether defective in quality and deficient in quantity. The incisors and the 6-year molars are most frequently affected. It is stated that in some localities a deficiency in the calcium content of drinking water results in hypoplasia of the teeth, but in this series of cases the causes operating to produce the defect were apparently general diseases of infancy and early childhood, and malnutrition where insufficient or improper feeding resulted in rickets. The disease noted as probable causative factors included measles, whooping cough, bronchitis, bronchopneumonia, chronic or subchronic nasal obstruction and malnutrition. Any disease causing this defect must occur before the child reaches the age of 3½ years when calcification is practically complete. The severity of the defect is influenced by the severity of the disease and the length of time it continues. The highest percentage of cases is found among the children of the poorer laboring classes. Of 10,000 children inspected, only two (brother and sister) showed typical Hutchinson's teeth. The teeth of children of tuberculous parents seemed to be remarkably free from hypoplasia but it was felt that fuller evidence should be collected on this point. Millican concludes that diseases of the respiratory system in infancy, and malnutrition are the chief causes of hypoplasia in teeth; and that the lack of breast feeding is an important factor. Special precautions in respect to feeding, and the prevention and care of disease should be carried out during the first five years of the child's life.

STATE SOCIETY OFFICERS AND DATES OF MEETINGS

Alabama—Birmingham, Tutwiler Hotel, April 5, 6, 7, 1926.
President: N. C. Glass, Age Herald Bldg., Birmingham.
Secretary-Treas.: F. F. Perry, 712 Shepherd Bldg., Montgomery.

Arizona—Phoenix, Arizona Club, February 1, 1926.
President: Logan D. Dameron, Jr., 211 Goodrich Bldg., Phoenix.
Secretary-Treas.: E. L. Paffard, 502 Goodrich Bldg., Phoenix.

Arkansas—Little Rock, Marion Hotel, May 17, 18, 19, 1926.
President: I. M. Sternberg, Merchants Nat'l Bank Bldg., Ft. Smith.
Secretary-Treas.: H. J. Crume, 1-2 Wilson Bldg., El Dorado.

California—Portland, Oregon. In conjunction with the Pacific Coast Dental Conference, 1926.
President: S. B. Fontaine, 1904 Franklin St., Oakland.
Secretary: B. Frank Gray, 909 Hyde St., San Francisco.
Treasurer: F. T. West, 2509 Mission St., San Francisco.

Southern California—Los Angeles.
President: A. H. Gilbert, 1200 First Nat'l Bank Bldg., San Diego.
Secretary: James W. Carson, 1209 Brockman Bldg., Los Angeles.
Treasurer: C. C. Noble, 514 Wright & Callender Bldg., Los Angeles.

Colorado—Colorado Springs, June 9, 10, 11, 12, 1926.
President: Harry W. Wilson, 421 Imperial Bldg., Denver.
Secretary: Harry B. Talhelm, 502 Mack Bldg., Denver.
Treasurer: William Smedley, 610 California Bldg., Denver.

Connecticut—Bridgeport, April 8, 9, 10, 1926.
President: A. A. McLaughlin, Medical Bldg., Bridgeport.
Secretary-Treas.: S. E. Armstrong, 185 Church St., New Haven.

Delaware—Hotel Du Pont, Wilmington, Second Wednesday of every month, 1926.
President: E. F. Cullen, Kane Apt., Wilmington.
Secretary: W. S. Straughn, 38 S. Bradford St., Dover.
Treasurer: P. Traynor, 807 Washington St., Wilmington.

District of Columbia—George Washington University, 2nd and 4th Tuesday evenings each month from October to June inclusive.
President: Vernon J. Lohr, 1029 Vermont Ave., Washington, D. C.
Secretary: W. M. Simkins, 720 Woodward Bldg., Washington.
Treasurer: M. F. Finley, 1928 I St., N.W., Washington.

Florida—
President: A. J. Myers, Box 353, Miami.
Secretary: H. G. Bow, Box 424, DeLand.
Treasurer: C. J. Masters, St. James Bldg., Jacksonville.

Georgia—Savannah, June 9, 10, 11, 1926.
President: N. G. Slaughter, Athens.
Secretary: G. A. Mitchell, 612 Candler Bldg., Atlanta.
Treasurer: Witherspoon Wallace, 633 Candler Bldg., Atlanta.

Hawaiian Islands—Honolulu, December, 1926.
President: G. R. Marsily, Boston Bldg., Honolulu.
Secretary: Allen Harwell, 312 James Campbell Bldg., Honolulu.
Treasurer: H. I. Kurisaki, Smith and Beretania St., Honolulu.

Idaho—Twin Falls, 1926.
President: C. A. Philpott, Overland Bldg., Boise.
Secretary: C. B. Over, Overland Bldg., Boise.
Treasurer: S. S. Evans, Preston.

Illinois—Springfield, May 11, 12, 13, 1926.
President: P. G. Puterbaugh, 29 E. Madison St., Chicago.
Secretary: A. E. Converse, Leland Office Bldg., Springfield.
Treasurer: T. L. Grisamore, 29 E. Madison St., Chicago.

Indiana—Claypool Hotel, Indianapolis, May 17, 18, 19, 20, 1926.
President: A. J. Kimm, 705 Citizens Bank Bldg., Evansville.
Secretary: C. L. Byers, 2138 N. Illinois St., Indianapolis.
Treasurer: W. C. Hessler, 312 Ben Hur Bldg., Crawfordsville.

Iowa—Des Moines, May 4, 5, 6, 1926.
President: Chas. H. Henshaw, 1112 Bankers Trust Bldg., Des Moines.
Secretary: Earle S. Smith, 613 E. Court St., Iowa City.
Treasurer: Frank Fourt, Fairfield.

Kansas—Wichita, The Forum, April 19, 20, 21, 1926.
President: C. A. Martin, Winfield.
Secretary: C. K. Weaver, Clay Center.
Treasurer: W. T. Triplett, Salina.

Kentucky—Louisville, April 5, 6, 7, 1926.
President: William E. Goepper, 1366 Bardstown Road, Louisville.
Secretary: W. M. Randall, 1035 Second St., Louisville.
Treasurer: H. J. Patrick, Paint Lick.

Louisiana—Hotel Roosevelt, New Orleans, March 3, 4, 5, 6, 1926.
President: Harry J. Siess, Mansura.
Secretary: W. B. Corley, 903 Guaranty Bank Bldg., Alexandria.
Treasurer: O. J. Ory, Garyville.

Maine—Augusta, Last week in June, 1926.
President: D. M. Small, Kennebunk.
Secretary: W. F. Fogg, 60 Main St., Waterville.
Treasurer: I. E. Pendleton, Lewiston.

Maryland—Baltimore, May 3, 4, 5, 1926.
President: J. Stephenson Hopkins, Belair.
Secretary: Norval H. McDonald, 304 Morris Bldg., Baltimore.
Treasurer: Walter E. Green, 2958 W. North Ave., Baltimore.

Massachusetts—Copley Plaza Hotel, Boston, May 3, 4, 5, 6, 7, 1926.
President: Harold W. Alden, 160 Main St., Northampton.
Secretary: William H. Gilpatric, 358 Commonwealth Ave., Boston.
Treasurer: Joseph T. Paul, 419 Boylston St., Boston.

Michigan—Detroit, April 12, 13, 14, 1926.
President: William A. Cook, 1853 David Whitney Bldg., Detroit.
Secretary: William R. Davis, 1932 Taylor Ave., Detroit.
Treasurer: E. J. Chamberlain, 526 Ashton Bldg., Grand Rapids.

Minnesota—St. Paul, The Auditorium, February 10, 11, 12, 1926.
President: A. T. Rowe, 820 LaSalle Bldg., Minneapolis.
Secretary: R. G. Keyworth, 1048 Lowry Bldg., St. Paul.
Treasurer: T. D. Abernathy, Rochester.

Mississippi—Meridian, April or May, 1926.
President: G. F. Haynes, Laurel.
Secretary: A. A. Allen, Amory.
Treasurer: C. K. Bailey, Grenada.

Missouri—Jefferson City, May 17, 18, 19, 1926.
President: Jesse Miller, Maryville.
Secretary: H. C. Pollock, Metropolitan Bldg., St. Louis.
Treasurer: J. F. McLellan, Moberly.

Montana—Helena, May 26, 27, 28, 1926.
President: H. K. Von der Heydt, 328 Rialto Bldg., Butte.
Secretary-Treas.: J. E. Buehler, 411 Ford Bldg., Great Falls.

National Capital—George Washington University. First Tuesday of each month.
President: Charles E. Detmer, 5522 Connecticut Ave., N. W., Washington.
Secretary: Philip A. Wood, 411 Cedar St., Takoma Park.
Treasurer: C. H. Howland, 2412 Pennsylvania Ave., Washington.

Nebraska—Lincoln, May 17, 18, 19, 20, 1926.
President: G. A. Grubb, University of Nebraska, Dental Dept., Lincoln.
Secretary: H. E. King, 546 Peters Trust Bldg., Omaha.
Treasurer: G. L. Spencer, 716 Security Mut. Bldg., Lincoln.

Nevada—Reno, December 4, 1926.
President: Fred J. Rulison, Sunderland Bldg., Reno.
Secretary: George A. Carr, 216 F. & M. Bank Bldg., Reno.
Treasurer: P. H. Phillips, Weck Bldg., Reno.

New Hampshire—
President: Otis M. Littlefield, Manchester.
Secretary: W. J. Moyles, 1061 Elm, Manchester.
Treasurer: W. A. Young, 40 No. Maine, Concord.

New Jersey—Trenton, Stacey-Trent Hotel, April 14, 15, 16, 17, 1926.
President: Frederick H. Lum, Jr., Maine St., Chatham.
Secretary: F. K. Heazelton, 223 East Hanover St., Trenton.
Treasurer: A. E. Boice, Broad St. Bank Bldg., Trenton.

New Mexico—Santa Fe, De Vargas Hotel, June 10, 11, 12, 13, 14, 15, 1926 (not definite).
President: Claude A. Schumaker, 1st Nat'l. Bank Bldg., Albuquerque.
Secretary-Treas.: E. G. Brentari, Belen.

New York—Hotel Astor, May 19, 20, 21, 22, 1926.
President: R. Ottolengui, 80 W. 40th St., New York City.
Secretary: A. P. Burkhart, 57 E. Genessee St., Auburn.
Treasurer: G. H. Butler, 715 University Block, Syracuse.

North Carolina—Richmond, Virginia, (joint meeting Virginia and North Carolina) April 13, 14, 15, 1926.
President: H. O. Lineberger, Odd Fellows Bldg., Raleigh.
Secretary-Treas.: E. B. Howle, Odd Fellows Bldg., Raleigh.

North Dakota—Grand Forks, May, 1926.
President: W. J. Hewitt, Grand Forks.
Secretary: F. B. Peik, Carrington.
Treasurer: R. S. Towne, Bismarck.

Ohio—Columbus, December 7, 1926.
President: Charles W. Strasnider, Citizens Bank Bldg., Columbus, Ohio.
Secretary: Edward C. Mills, 255 E. Broad St., Columbus.
Treasurer: A. O. Ross, 807 N. High St., Columbus.

Oklahoma—Tulsa, April 20, 21, 22, 23, 1926.
President: W. T. Jacobs, 205 Barnes Bldg., Muskogee.
Secretary: C. L. White, 1205 Medical Arts Bldg., Oklahoma City.
Treasurer: C. A. D. Beer, American Nat'l Bank, Enid.

Oregon—Portland, June, 1926.
President: O. T. Wherry, Stephens Bldg., Portland.
Secretary: F. W. Hollister, Morgan Bldg., Portland.
Treasurer: O. J. Ferris, Park Bldg., Portland.

Pennsylvania—Philadelphia. (With 7th International Dental Congress) August 23, 24, 25, 26, 27, 1926.
President: C. R. Turner, 40th and Spruce Sts., Philadelphia.
Secretary: A. C. Barclay, 914 Highland Bldg., Pittsburgh.
Treasurer: A. B. Miller, Kingston.

Porto Rico—Ponce, June 25 and 26, 1926.
President: Jose Vicente, Salvador Brau St., San Juan.
Secretary: Jose Hernandez Gutierrez, Box 1448, San Juan.
Treasurer: R. Fernandez Carballo, Stop 18, Santurce.

Rhode Island—Providence, Jan 13 and 14, 1926.
President: Henry A. Martin, 60 Touro St., Newport.
Secretary: Philip A. Duffy, Maine St., East Greenrich.
Treasurer: Frank Hackrill, 224 Thayer St., Providence.

South Carolina—Columbia, May, 1926.
President: A. Weinberg, Sumter.
Secretary: Ernest C. Dye, Jordon Bldg., Greenville.
Treasurer: J. A. S. Pike, Columbia.

South Dakota—Sioux Falls, May 11, 12, 13, 1926.
President: W. W. Price, Centerville.
Secretary: E. W. Elmen, Sioux Falls.
Treasurer: E. O. Dietrich, Sioux Falls.

Tennessee—Nashville, May 4, 5, 6, 7, 1926.
President: Joe Minor, Lambuth Bldg., Nashville.
Secretary-Treas.: James B. Jones, 1-3 Cannon Bldg., Murfreesboro.

Texas—Wichita Falls, April 20, 21, 22, 23, 1926.
President: F. F. Brown, Wichita Falls.
Secretary-Treas.: J. G. Fife, Medical Arts Bldg., Dallas.

Utah—
President: E. E. Greenwell, Eccles Bldg., Ogden.
Secretary-Treas.: C. R. Dalgleish, 810 Deseret Bank Bldg., Salt Lake City.

Vermont—Burlington, May 12, 13, 14, 1926.
President: H. B. Small, Church St., Burlington.
Secretary: L. C. Robinson, Morrisville.
Treasurer: H. R. Bristol, Bennington.

Virginia—Richmond, Jefferson Hotel, April 13, 14, 15, 1926.
President: Harry Bear, Professional Bldg., Richmond.
Secretary-Treas.: J. B. Williams, 1000 W. Grace St., Richmond.

Washington—Portland, Oregon, June 21, 22, 23, 24, 25, 26, 1926.
President: A. D. Remington, Medical Dental Bldg., Seattle.
Secretary-Treas.: Will G. Crosby, Medical Dental Bldg., Seattle.

West Virginia—Clarksburg, May 17, 18, 19, 1926.
President: H. L. Satterfield, Fairmont.
Secretary: F. M. Farnsworth, Buckhannon.
Treasurer: J. S. Stone, Clarksburg.

Wisconsin—Milwaukee, July 13, 14, 15, 1926.
President: M. H. Mortonson, 1st Nat'l Bk. Bldg., Milwaukee, Wis.
Secretary: R. W. Huegel, 104 King St., Madison.
Treasurer—P. A. Howell, Beloit.

Wyoming—Lander, July 13, 14, 15, 1926.
President: J. J. Donovan, Casper.
Secretary: E. C. Andrews, Cheyenne.
Treasurer: Peter Apple, Jr., Cheyenne.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Dental Society of Europe, April 5-7, 1926, Nice.

American Dental Hygienists' Association, August 23-28, 1926, Philadelphia, Pennsylvania.

American Medical Association, April 19-23, 1926, Dallas, Texas.

American Society of Orthodontists, August 16, 1926, New York City.

International Orthodontic Congress, August, 16-20, 1926, New York City.

Pacific Coast Dental Conference, June 21-26, 1926, Portland, Oregon.

Seventh International Dental Congress, August 23-28, 1926, Philadelphia, Pennsylvania.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

National Capital at Washington, D. C., first Tuesday of every month.

January (1926)

Rhode Island, at Providence (13-14).

February (1926)

Minnesota, at St. Paul (10-12).

March (1926)

District of Columbia, at Washington D. C., (24-26).
Louisiana, at New Orleans.

April (1926)

Alabama, at Birmingham (5-7).
Connecticut, at Bridgeport.
Kansas, at Wichita (19-21).
Kentucky, at Louisville (5-7).
Michigan, at Detroit (12-14).
New Jersey, at Trenton (14-17).
North Carolina, at Richmond, Va. (13-15).
Texas, at Wichita Falls (20-23).
Virginia, at Richmond (13-15).

May (1926)

Illinois, at Springfield (11-13).
Indiana, at Indianapolis (17-20).
Maryland, at Baltimore (3-5).
Massachusetts, at Boston (3-7).
Missouri, at Jefferson City (17-19).
Montana, at Helena (26-28).
Nebraska, at Lincoln (17-20).
New York, at New York City (19-22).
South Carolina, at Columbia.
South Dakota, at Sioux Falls (11-13).
Tennessee, at Nashville (4-7).
West Virginia, at Clarksburg (17-19).

June (1926)

California, at Portland, Oregon.
Colorado, at Colorado Springs (9-12).
Georgia, at Savannah (9-11).
Maine, at Augusta (last week).
New Mexico, at Santa Fe (20).
Oregon, at Portland.
Washington, at Portland, Ore. (8-13).

July (1926)

Wisconsin, at Madison (14-16).

August (1926)

Pennsylvania, at Philadelphia.

November (1926)

Arizona, at Phoenix.

Baltimore City Dental Society, February 5-6, 1926.

California State Alumni Chapter, Psi Omega Fraternity, at Oakland, California, February 20, 1926.

Central Pennsylvania Dental Society, at Johnston, Pennsylvania, February 22-24, 1926.

Chicago Dental Society, at Chicago, January 27-29, 1926.

Marquette University Dental Alumni Association, at Milwaukee, Wisconsin, February 17-19, 1926.

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

Delaware, at Wilmington, January 20-21, 1926. Secretary, W. S. P. Combs, Middletown, Delaware.

District of Columbia, January 4-8, 1926. Secretary, C. Willard Camalier, 206 Medical Science Building, Washington, D. C.

North Carolina, at Raleigh, January 11, 1926. Secretary, F. L. Hunt, Asheville, North Carolina.

North Dakota, at Fargo, January 12, 1926. Secretary, W. E. Hocking, Devils Lake, North Dakota.

Oklahoma, at Oklahoma City, January 11-15, 1926. Secretary, L. M. Doss, 201 American National Bank Building, Oklahoma City, Oklahoma.

DISTRICT OF COLUMBIA DENTAL SOCIETY

The annual postgraduate clinic of the District of Columbia Dental Society will be held at the Raleigh Hotel, Washington, D. C., March 24-26, 1926. Class clinics or group clinics are being arranged. Exhibitors will please communicate with

W. W. WYMAN, *Chairman*,
Clinic Committee,
724 Upshur St., N. W.,
Washington, D. C.

KENTUCKY STATE DENTAL ASSOCIATION

The fifty-seventh annual meeting of the Kentucky State Dental Association will be held in Louisville, April 5-7, 1926, at the Seelbach Hotel.

W. M. RANDEL, *Secretary*,
1035 Second St., Louisville, Ky.

PACIFIC COAST DENTAL CONFERENCE

The Pacific Coast Dental Conference will be held in Portland, Ore., June 21-26, 1926. This conference is sponsored by nine state and provincial dental societies along the Pacific Coast.

L. A. MORRIS, *Chairman*,
Publicity Committee,
Oregon City, Ore.

AMERICAN DENTAL SOCIETY OF EUROPE

The next meeting of the American Dental Society of Europe will take place at Nice, April 5-7, 1926.

E. D. BARROWS, *Secretary*,
71 Harley St., London, W. I.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

(Preliminary Notice)

The next meeting of the American Dental Hygienists' Association will be held in conjunction with the American Dental Association in Philadelphia, Pa., August 23-28, 1926.

LEONA M. MITCHELL, *Secretary*,
State Department of Health,
Harrisburg, Pa.

THE AMERICAN SOCIETY OF DENTAL RADIOGRAPHERS

The American Society of Dental Radiographers will hold their midwinter meeting at the Drake Hotel, Chicago, Ill., Saturday, January 30, 1926, at 9 o'clock.

ARNOTT A. MOORE, *Secretary*,
131 Allen Street,
Buffalo, N. Y.

AMERICAN SOCIETY OF ORTHODONTISTS

The twenty-fourth annual meeting of the American Society of Orthodontists will be held, August 16, 1926, at the Hotel Commodore, New York City.

WALTER H. ELLIS, *Sec'y-Treas.*,
397 Delaware Ave., Buffalo, N. Y.

CHICAGO DENTAL SOCIETY MIDWINTER CLINIC

JANUARY 27, 28, 29, 1926—HOTEL DRAKE

SYNOPSIS OF PROGRAM

Section I—Operative Dentistry

Essayists: Russell W. Bunting, Ann Arbor; Paul A. Barker, Denver; W. A. Chamberlain, St. Louis; R. H. Volland, Iowa City; Harold O. Hansen, Chicago; Arthur D. Black, Chicago.

Discussers: Percy R. Howe, Boston; G. J. Dennis, Chicago; F. B. Rhobotham, Chicago; C. Carroll Smith, Peoria; Edgar D. Coolidge, Chicago; Lucien H. Arnold, Chicago; V. T. Nylander, Chicago; R. E. Blackwell, Chicago; D. N. Lewis, Lake Forest; John V. Conzett, Dubuque; Robert Cruse, Chicago.

Section II—Full Denture Prosthesis

Essayists: F. F. Molt, Chicago; John M. Besser, Chicago; J. W. Crawford, Milwaukee; Rudolph L. Hanau, Buffalo; Rupert E. Hall, Chicago; E. Byron Kelly, Chicago; John B. LaDue, Chicago.

Discussers: E. L. Dunn, Chicago; Robert R. Gillis, Hammond; J. B. Olech, Chicago; George P. Brenner, Milwaukee; C. S. Bigelow, Evanston; W. A. Giffen, Detroit; R. O. Schlosser, Chicago; S. D. Green, Chicago; E. C. Pendleton, Chicago.

Section III—Partial Denture Prosthesis

Essayists: Hart J. Goslee, Chicago; Stanley J. Tylman, Chicago; Walter F. Chappelle, Buffalo; J. J. Moffitt, Harrisburg; Robert E. MacBoyle, Chicago; F. E. Roach, Chicago.

Discussers: J. C. Mortonson, Milwaukee; W. D. N. Moore, Chicago; G. W. Dittmar, Chicago; P. A. Pyper, Pontiac; Albert Grunn, Chicago; L. C. Burgard, Louisville; F. VanMinden, Chicago; Raymond M. Bondy, Chicago; Clyde J. Miller, Chicago; E. I. Payne, Chicago; George E. Meyer, Chicago; Arthur J. Skupa, Chicago; George Kolar, Chicago; L. J. Weinstein, New York.

Section IV—Oral Surgery, Anesthesia and Diagnosis

Essayists: John F. Christiansen, Chicago; Joseph C. Beck, Chicago; Vilray P. Blair, St. Louis; Robert H. Buck, Chicago; J. A. Heidbrink, Minneapolis; A. H. Barnes, Rochester; Joseph E. Schaeffer, St. Louis; J. E. Nyman, Chicago; Ralph H. Fouser, Chicago; Arnott A. Moore, Buffalo; Roy S. Hopkinson, Milwaukee; George E. Meyer, Chicago; Lewis A. Platts,

Chicago; James A. Blue, Birmingham; Louis Schultz, Sr., Chicago; W. H. G. Logan, Chicago; Herbert E. Potts, Chicago; F. B. Moorehead, Chicago; B. A. Morris, Chicago; E. J. Ryan, Chicago; T. I. Lerche, Chicago; Stanley W. Clark, Chicago.

Discussers: Joseph P. Wahl, New Orleans; Mary Lyons, Chicago; Frances Haynes, Chicago; C. S. Suddarth, Chicago; Charles W. Freeman, Chicago; F. B. Moorehead, Chicago; Herbert E. Potts, Chicago; Louis Schultz, Sr., Chicago; W. H. G. Logan, Chicago; F. W. Merrifield, Chicago; Vernon M. Leech, Chicago; Edward H. Hatton, Chicago; F. F. Molt, Chicago; G. R. Lundquist, Chicago; O. H. Helmer, Chicago; R. W. Lee, Chicago; R. I. Lewis, Chicago; A. E. DeRiemer, Chicago; Howard C. Miller, Chicago; I. G. Jirka, Chicago; W. S. Heermans, Chicago; Joseph G. Wiedder, Chicago; M. G. Fox, Chicago; E. C. Hume, Chicago.

Section V—Orthodontia

Essayists: Max E. Ernst, St. Paul; Frank M. Casto, Cleveland; M. J. Buckley, Chicago; Thomas L. Grisamore, Chicago.

Discussers: A. Florence Lilley, Chicago; Mary Newell, Chicago; W. A. Murray, Evanston; J. C. McGuire, Evanston; Asa J. LaGrow, Oak Park.

Section VI—Periodontia

Essayists: L. Pierce Anthony, Philadelphia; Thomas B. Hartzell, Minneapolis; Percy R. Howe, Boston; E. A. Schmuck, Chicago; C. H. Schott, Cincinnati; H. W. MacMillan, Cincinnati.

Discussers: Thomas B. Hartzell, Minneapolis; Charles A. Elliot, Chicago; F. B. Noyes, Chicago; G. R. Lundquist, Chicago; F. W. Merrifield, Chicago.

Section VII—Mouth Hygiene and Preventive Dentistry

Essayists: Isaac D. Rawlings, Springfield; G. H. Wandel, Iowa City; Grace Rogers Spalding, Birmingham; William F. Whalen, Peoria; M. H. Killip, Chicago; Louis Ottofy, Chicago; Arthur D. Black, Chicago; Herman N. Bundesen, Chicago; John M. Dodson, Chicago; Edward L. Pettibone, Cleveland; Evelyn C. Schmidt, Chicago.

Section VIII—Public Health and Educational Exhibits

Food and Nutrition Exhibit; General Health Examinations; Dental and Roentgenographic Examinations with Diagnosis.

Section IX—Roentgenology

Essayists: Howard R. Raper, Albuquerque; C. Edmund Kells, New Orleans; C. O. Simpson, St. Louis; Ira C. Brownlie, Denver.

Discussers: Arnott A. Moore, Buffalo; Frank J. Bernard, Chicago; Hollis E. Potter, Chicago; A. C. Tenney, Chicago; C. F. B. Stowell, Chicago; M. J. Hubeney, Chicago; F. F. Molt, Chicago.

Section X—Pathology, Materia Medica and Therapeutics

Essayists: Joseph L. Miller, Chicago; C. N. Johnson, Chicago; Russell L. Haden, Kansas City; P. G. Puterbaugh, Chicago; E. D. Coolidge, Chicago; W. G. Skillen, Chicago.

Discussers: Arthur D. Black, Chicago; U. G. Rickert, Ann Arbor; Edward H. Hatton, Chicago.

Clinics

National Clinic Day:

One hundred clinicians from outside Chicago will give clinics on all phases of dental technic and operation.

Chicago Clinic Day:

More than one hundred Chicago clinicians will present demonstrations similar to those presented by the national clinicians.

General Sessions

Two general sessions will be held, one on Wednesday evening, the other Thursday noon.

A man of national prominence, outside the field of dentistry, will address the Wednesday evening gathering, while the Thursday session will be in the nature of a good-fellowship luncheon.

Banquet

The annual banquet, to be held on Thursday evening, will be in honor of Sheppard W. Foster, President of the American Dental Association. A program of brief talks, with several entertainment features, will provide a delightful time for those who attend. Dancing will follow the dinner.

Railroad Rates

A rate of one and one-half fare for the round trip has been granted by the railroads. A one way ticket to Chicago should be purchased and a certificate obtained from the selling agent. This certificate, when validated at the Drake, by the special agent of the carriers, entitles the purchaser to one-half fare for the return trip.

To Members of the American Dental Association and of Foreign Dental Societies

A most cordial invitation is extended to members of the American Dental Association and of foreign dental societies to attend this annual event. The Chicago Dental Society bids you welcome!

Hugo G. Fisher, *Secretary*,
25 E. Washington Street.

FIRST INTERNATIONAL ORTHODONTIC CONGRESS

The First International Orthodontic Congress will be held in New York City, August 16-20, 1926.

MARTIN DEWEY,
501 Fifth Avenue,
New York City.

CHICAGO ALUMNI CHAPTER OF THE PSI OMEGA FRATERNITY

The January meeting of the Chicago Alumni Chapter of the Psi Omega Fraternity will be held during the midwinter clinic of the Chicago Dental Society January 27-29, at the Drake Hotel, Chicago, Ill. The annual banquet will be held Friday, January 29. All visiting Psi Omegas are urged to remain for this affair.

T. E. JOHNSON, *Grand Master*,
1933 Milwaukee Avenue.
S. A. HUTT, *Secretary*,
3166 Lincoln Ave., Chicago, Ill.

NEW YORK CITY ALUMNI CHAPTER OF NATIONAL ALUMNI CHAPTER, XI PSI PHI FRATERNITY

To the members of the chapter:

Will all alumni of the Xi Psi Phi Fraternity residing in or about New York City please write to the undersigned for complete details of membership and coming events.

STANLEY SLOCUM, *Secretary*,
597 Fifth Avenue, New York City.

RESOLUTIONS ON THE DEATH OF DR. CARR

WHEREAS, it has pleased the Almighty God, in his inscrutable wisdom, to remove by death our esteemed and useful brother in the profession, Dr. William Carr and

WHEREAS, the First District Dental Society of the State of New York has suffered the loss through death of Dr. William Carr, whose sudden passing away on Oct. 14, 1925, has deprived us of the fellowship of one who has been an esteemed and active member since the inception of this Society and the last surviving charter member, and who has also served as its President during the years 1885-1886; 1886-1887; 1892-1893 and 1893-1894 and as Vice President, 1870-1871; District Censor, 1871-1872 and on the Executive Committee, 1889-1890;

WHEREAS, in the death of Dr. Carr this Society has lost a valued member as well as has the profession, therefore, be it

Resolved, that the First District Dental Society of the State of New York extend our sincere sympathy to Mrs. Carr in her bereavement, which is the bereavement of the whole profession and express our high regard for the work and character of this pioneer; and be it further

Resolved, that a copy of these resolutions be spread upon the minutes, inserted in the bulletin and sent to the members of his family and to the dental journals for publication.

B. W. WEINBERGER, *Chairman*,
Necrology Committee.

BOOKS RECEIVED

Food, Nutrition and Health. By E. V. McCollum, Ph.D., Sc.D., and Nina Simmonds, Sc.D. (Hygiene), Professor and Associate Professor, respectively, of Chemical Hygiene, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Md. Published by the authors; price $1.50, postpaid. This little book of 143 pages tells a story that should have been told before. But probably it was not possible to tell it until the various principles advocated in it were carefully worked out in detail, and given to the world in a more elaborate form, as they were in the authors' previous work "The Newer Knowledge of Nutrition." The prediction is here made that the present volume will be read by ten persons where the more pretentious work was read by one. It contains the essence of the subject stated in simple language, and stripped of all verbiage; and it can be followed by the lay reader as readily as by the scientist. It will appeal to the dentist because of its simplicity and practical utility.

If the Foundation Gives--- The Edifice Topples

By Ernest V. Madison

MAN praises to friends and business associates that which he knows through experience or repute to be reliable and efficient.

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This spoken force—"word-of-mouth" advertising—can be as effective *against* as *for* commercial success. How important it is, therefore, that an advertiser's products fulfil in every way the claims of the printed word. And how necessary it is that he put into the manufacture of the advertised product the utmost in materials, workmanship and service.

Products advertised in this issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION are desirable in every way. Their general excellence is the very foundation on which the manufacturer's advertising edifice rests. If it crumbles, the entire edifice topples and is lost.